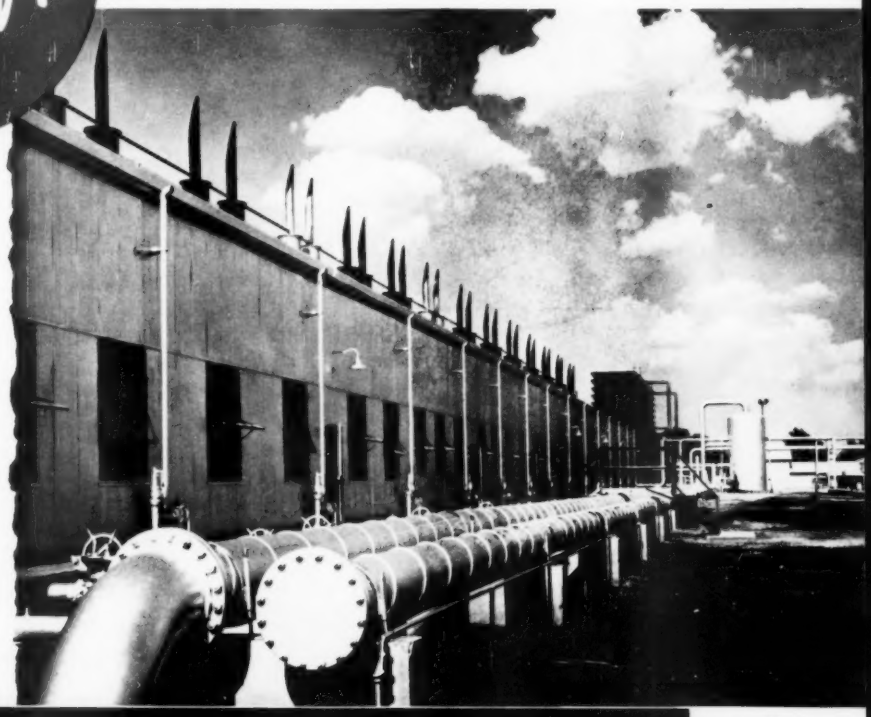
L AND GAS URNAL

Specify

WARREN'S *Stabilized*

NATURAL GASOLINE or STA-VOL-ENE



FOR KNOCKLESS

QUICK STARTING

CARBON FREE

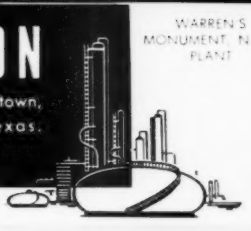
UNIFORM MOTOR FUEL

WARREN PETROLEUM CORPORATION

Producers, Manufacturers, Exporters and Marketers

Export Terminals: Corpus Christi, Port Arthur, Baytown, Texas City, and Norsworthy, Houston, Texas.

TULSA 2 OKLAHOMA CABLE ADDRESSES: Stavolene, Warren



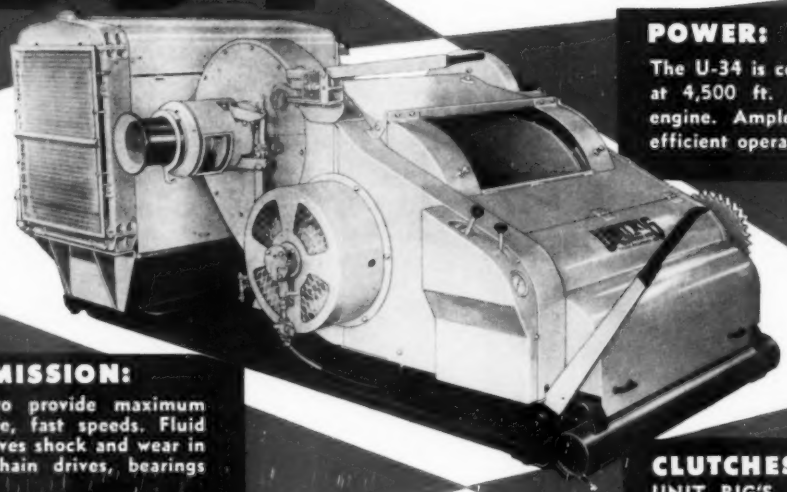
WARREN'S MONUMENT, N. M. PLANT

Crude Oil, Natural Gasoline and Liquefied Petroleum Products

PRICE 50 CENTS TABLE OF CONTENTS PAGE 129 **APRIL 20, 1950**

U-34

CUT COSTS on shallow well drilling. . .



POWER:
The U-34 is conservatively rated at 4,500 ft. with a 275 H.P. engine. Ample power for fast, efficient operation and long life.

TRANSMISSION:
Designed to provide maximum pull at safe, fast speeds. Fluid coupling saves shock and wear in clutches, chain drives, bearings and line.

CLUTCHES:
UNIT RIG'S Air-O-Matic . . . time-tested under all conceivable conditions. Eliminates adjustments. Same type used on rigs of much greater capacity.

Smooth, fast, trouble-free performances are the keys to drilling in any well at minimum cost. All these features were taken into consideration when the U-34 was designed. That's why this popular, compact UNIT RIG model is being used more than ever before for shallow well drilling and servicing.

Designed for Top Performance. .

Write for Bulletin

UNIT RIG & EQUIPMENT CO.
TULSA, OKLAHOMA U.S.A.

DESIGNED FOR THE JOB. . . .

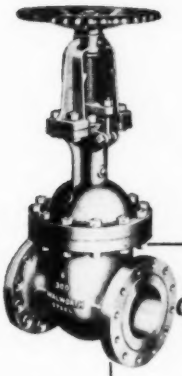
Exclusive Export Representative
MID-CONTINENT SUPPLY CO.
42 Broadway, New York City
Cable Address: MIDUNITRIG

WALWORTH

Cast Steel Gate Valves

Series 150 and 300

Wedge Gate — Outside Screw and Yoke



Sectional view of Series 300

Big 8-Point Superiority!

Gland clearances are such that stem cannot be scored if gland should be tightened unevenly.

Deep Stuffing Boxes in all sizes (2" to 24") insure tightness and maximum packing life – costly leaks are eliminated.

Bonnets and Bodies are engineered to withstand pressure and minimize distortion – they're tough, durable, dependable.

Heavy Steel Walls provide extra strength and longer life.

Integral Body Guide Rib Faces are machined to insure accurate disc seating.

Seat Rings are bottom seated – not flange type. No recess exists at back of ring – hence no turbulence, erosion, or pressure drop.

Streamlined Ports allow high velocity, non-turbulent flow, and reduce the possibility of erosion.

Valves regularly have flanged ends. They can be supplied with ends for butt welding. Roller bearing yokes are available. On valves 5 inches and larger, by-passes can be furnished.

For Series 600 and higher, we recommend Walworth Pressure-Seal Steel Gate Valves.

For further information on Walworth Cast Steel Gate Valves, see your local Walworth distributor, or write:

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

The Oil and Gas Journal, published Thursdays by The Petroleum Publishing Company. Entered as second-class matter September 1, 1910 at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $3 yearly. Copyright 1950

No Man
in the Picture
. . . and that's the way you usually see Fairbanks-Morse "ZC" Engines . . . and a big reason why they're the favorites in the fields. They rarely require attention or maintenance. Just start them and forget them. They keep right on going. There are no complicated parts . . . no delicate adjustments to cause trouble, and that's an important point with present-day high maintenance labor costs. See your supply store about a "ZC" Engine and forget your pumping problems. Fairbanks, Morse & Co., Chicago 5, Illinois.
FAIRBANKS-MORSE,
a name worth remembering
OIL FIELD EQUIPMENT • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • PUMPS • SCALES • HOME WATER SERVICE AND HEATING EQUIPMENT RAIL CARS • FARM MACHINERY

Don't risk decay— use clean

PENTA-PROTECTED Wood

chlorophenol

Long lasting— will not Leach!

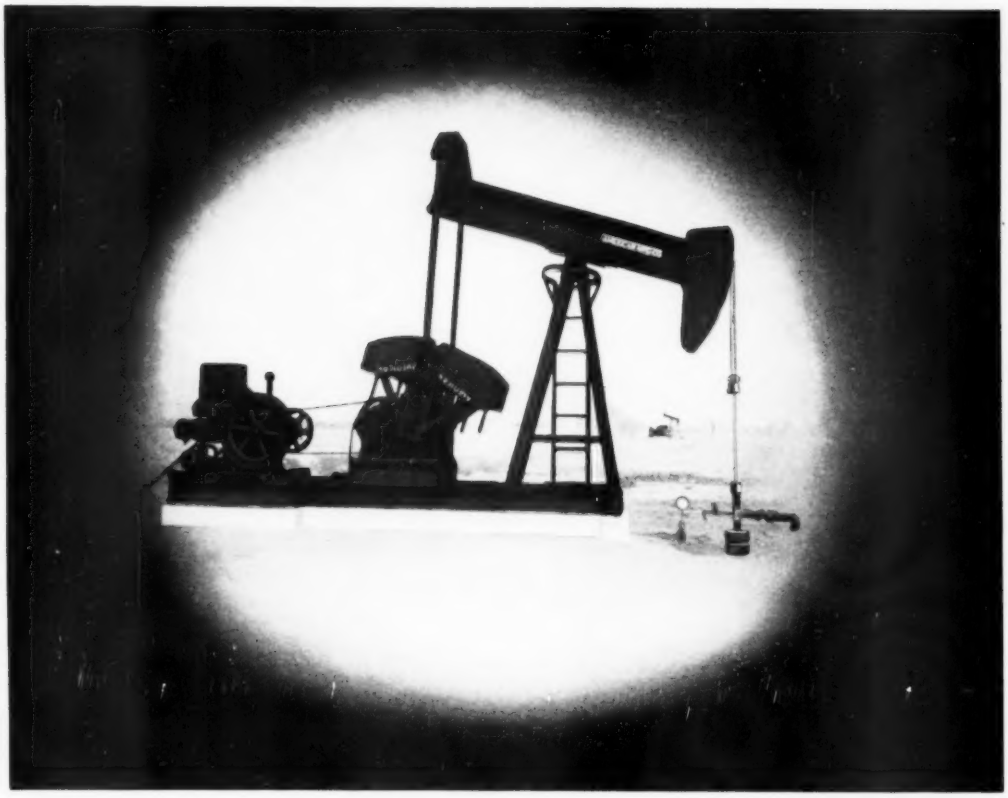
ON MARINE PLATFORM LUMBER . . .

Don't take chances with wood decay! Use PENTA-treated wood and know you're safe. PENTA-protection is effective protection against both decay and wood-attacking insects. PENTA-PROTECTED wood is clean, easy to handle, and lasts for years. The low water solubility of PENTAchlorophenol prevents leaching under the most adverse conditions.

Ask your lumber supplier for PENTA-PROTECTED wood. For more complete information write Dow, Dept. PE 32.

DOW penta- chlorophenol

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN



American Pumping Units = Low Pumping Costs

Contact your favorite supply store or the nearest American office NOW.

Lower pumping costs for the operator in the field is the result of 26 years of working to improve American equipment. The 1950 AMERICANS are designed to A. P. I. Specifications throughout, and engineered for longer service with less servicing, and maximum production with a minimum of power consumption. Today there are thousands of American Pumping Units in the fields pumping profitably . . . some that have been on the job continuously for 15 years.

When you have wells ready to go on the pump, or when you replace inefficient pumping equipment, it will pay you to check on the cost-cutting advantages of the new AMERICAN Pumping Units.

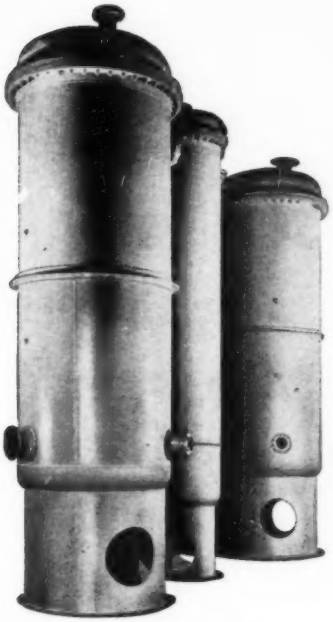
Branches:
Houston, Texas, 320 West Bldg., Ph. Ch. 4-3301
Tulsa, Okla., 1506 Hunt Building, Phone 4-8785

26th Year

Kilgore, Texas, P. O. Box 222, Phone 2338
Odessa, Texas, P. O. Box 983, Phone 3472
New York, N. Y., 500 Fifth Ave., Ph. LA. 4-4857

AMERICAN MANUFACTURING COMPANY OF TEXAS
FORT WORTH, TEXAS **PHONE 8-2301**

When you design DRYing into a process show Lectrodryer where



Large Lectrodryers are field-erected.

The type of Lectrodryer you need has probably already seen service somewhere else—time-tested and proved. No need for you to have the bother, expense and hazards of developing a new drier. Lectrodryers are as standard as motors.

Call in a Lectrodryer engineer when you first recognize the need for DRYing. He knows the pitfalls to avoid, its limitations and possibilities, short-cuts to take. He's had a world of experience solving problems in DRYing air, gases and organic liquids.

Plant designers, builders and owners find that Lectrodryer service saves them time and money. We can give you a quick estimate on Lectrodryers of any type or size, enabling you to make other engineering decisions without delay. Write Pittsburgh Lectrodryer Corporation, 325 32nd Street, Pittsburgh, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In Australia: Birlec, Limited, 51 Parramatta Road, Glebe, Sydney.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

REGISTERED TRADEMARK U.S. PAT. OFF.

How to bring down the cost of bringing oil up

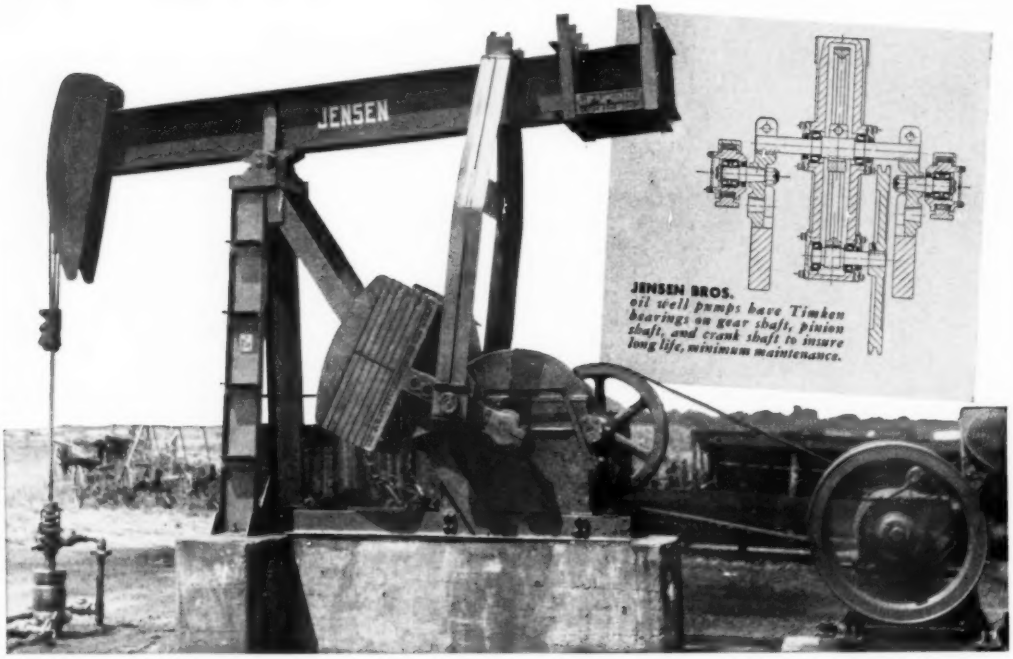
JENSEN BROS. MFG. COMPANY, of Coffeyville, Kansas, designed this oil well pump with an eye to low maintenance cost. They mounted the gear shaft, pinion shaft, and crank shaft on Timken® tapered roller bearings. Timken bearings at these important points insure trouble-free operation and save maintenance time and money for the operator.

Timken bearings hold gears and shafts in proper alignment. Excessive wear on moving parts is eliminated. Lubrication time is reduced because Timken bearings permit closures which retain lubricants—keep out dirt and moisture.

Timken tapered roller bearings have extra load-carrying capacity due to the line contact between rolls and races. Tapered design enables them to carry any combination of radial and thrust loads. True rolling motion and incredibly smooth surface finish practically eliminate friction. And Timken bearings normally last the life of the machine because they are (1) engineered for the job, (2) made of Timken fine alloy steel, and (3) precision manufactured.

Backed by 50 years of bearing research and development, Timken bearings are first choice throughout industry. No other bearing can bring you *all* the advantages you get with Timken bearings. Look for the trade-mark "Timken" on every bearing you buy, separately or in machines. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



JENSEN BROS. *oil well pumps have Timken bearings on gear shaft, pinion shaft, and crank shaft to insure long life, minimum maintenance.*

FINISHED TO CLOSER TOLERANCES

Finishing to incredible smoothness accounts for much of the precise, smooth rolling performance of Timken bearings. This honing operation is typical of the amazingly accurate manufacturing methods at Timken.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

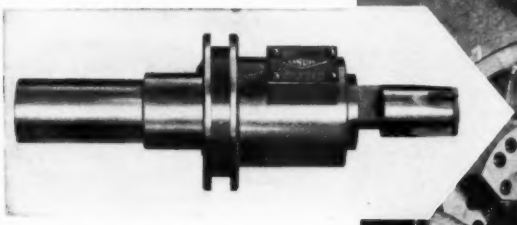
TIMKEN

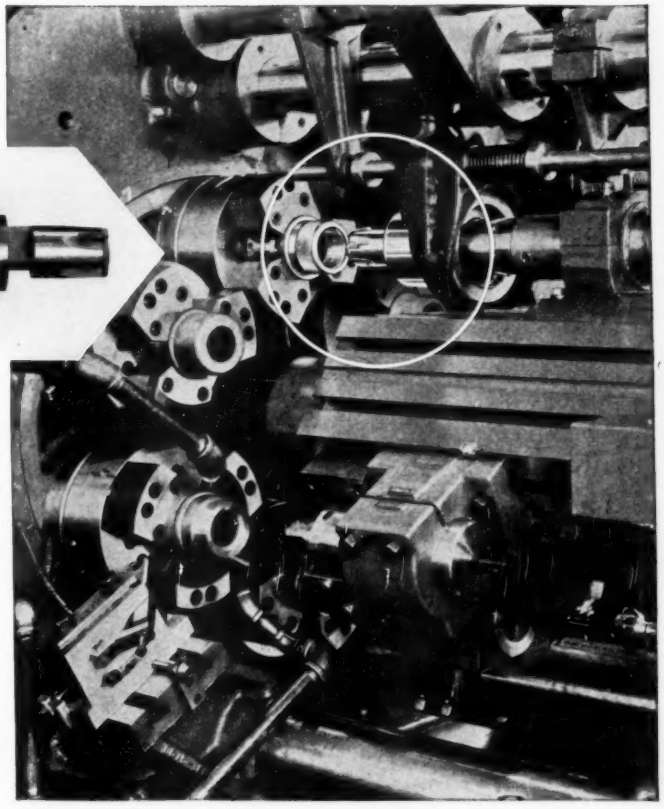
TRADE-MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS

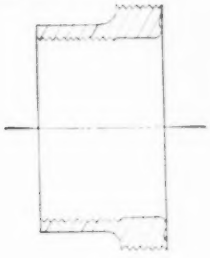
NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◫ AND THRUST ◫← LOADS OR ANY COMBINATION ✳

IMPROVED LANDIS TAP...





• CUTS INTERNAL TAPERED THREADS AT 30 FEET PER MINUTE.



Using the new Landis Style LL Receding Chaser Collapsible Tap on an automatic screw machine, 2" 11½ pitch tapered pipe threads 1-5/16" long are tapped in quick change unions for oil field use at the rate of 30 feet per minute. The unions are cold worked forging 2⅜" in diameter of 185-220 Brinell hardness. The same piece is also made of malleable iron, and tapered threads are tapped at the rate of 120 feet per minute.

The LL Taps are designed primarily for tapping tapered threads to A.P.I. standards. An outstanding feature is the detachable tap head permitting the use of various size tap heads to cover a wide range of thread sizes with a minimum amount of equipment.

In the improved Style ALM Heads, where an even number of chasers is used, no two chasers are directly opposite each other. This adds greater rigidity for the tap and permits the use of greater radial clearance, giving a freer cutting action with resulting increased chaser life. The Style LL Tap Body is made in four sizes to cover a range of nominal pipe sizes from 1" to 12", inclusive.

Write for Bulletin G-95

LANDIS MACHINE CO.
WAYNESBORO, PA., U. S. A.

Represented in the Domestic Oil Fields by: Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; C. J. Harter Machinery, Houston, Texas; Frederic-Baker Co., New Orleans, La.; Moore Machinery Co., Los Angeles and San Francisco, Calif.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

New arrivals

COMPLETE THE FAMILY

With the opening of another pipe mill, Kaiser Steel now rounds out its extensive range of pipe sizes by offering a dependable source of electric resistance weld, plain end pipe.

Diameters range from 5⅛ inches to 12¾ inches, in lengths up to 55 feet.

The addition of this new pipe mill now makes it possible for Kaiser Steel to meet practically every transmission pipe requirement of the petroleum, gas and water industries in the western two-thirds of the nation.

It is another illustration of our policy to keep pace with the needs of our customers.

Kaiser Steel pipe to latest API and ASTM specifications—in diameters from ½ inch to 30 inches, and in lengths up to 40 feet—is now available. Shipping points are Fontana and Napa, California.

It's good business to do business with

Kaiser Steel

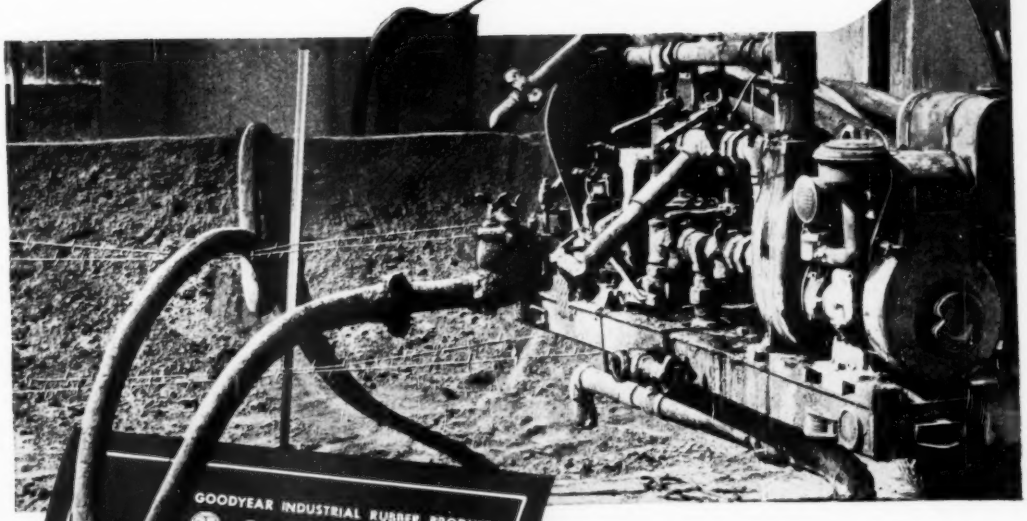
KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	8⅝" to 22" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅛" to 12¾" O.D.	Up to 55'	.188" to .400"	Fontana, Calif.
Electric Fusion Weld—Exponded—Plain End	24" to 30" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser

Prompt, dependable delivery at competitive prices • KAISER STEEL CORPORATION Los Angeles, Oakland, Seattle, Portland, Houston, Tulsa, New York

Texas Oil Treater Reports:

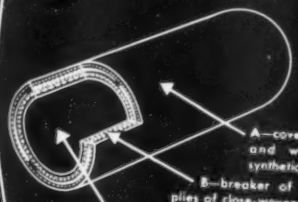
"Best Tank Hose we've ever used"



GOODYEAR INDUSTRIAL RUBBER PRODUCTS

G.T.M.-Specified

STYLE 213-H TANK FILLER HOSE


A—cover of abrasion-, sun- and weather-resistant synthetic
B—breaker of open-mesh fabric; plies of close-woven cotton and helix of heavy, flexible round steel wire for reinforcement
C—tube resists oil, gasoline and other petroleum products

OIL seepage through holes in the cover caused by rough handling led previously used hose to fail prematurely in its job of handling hot oil under pressure. Oil seeped into hose carcass, causing failure of adhesion between tube and carcass and carcass and cover. Since changing to Goodyear's Style 213-H Tank Filler Hose—as specified by the G.T.M.—Goodyear Technical Man—user reports he has never had to replace a single length due to tube or friction failure.

To consult the G.T.M. about your hose problems, write Goodyear, Akron 16, Ohio or get in touch with your nearest Goodyear Industrial Rubber Products Distributor.

FOR HOSE, FLAT BELTS, V-BELTS, MOLDED GOODS, PACKING, TANK LINING built to the world's highest standard of quality, phone your nearest Goodyear Industrial Rubber Products Distributor.

We think you'll like "THE GREATEST STORY EVER TOLD"—Every Sunday—ABC Network

GOODYEAR

THE GREATEST NAME IN RUBBER

Tame those touchy hydrocarbons

with a BJ Stuffingboxless Pump

Engineered for safe, simple, economical handling of butane, propane, ethane and other volatile hydrocarbons . . .

CAN'T ESCAPE

Leakage of pumped fluid to atmosphere is impossible. The motor and close-coupled pump are totally enclosed in a sealed pressure vessel. There's no fire hazard or danger to property or personnel caused by leakage.

ABLE TO CONTAIN HIGH PRESSURES

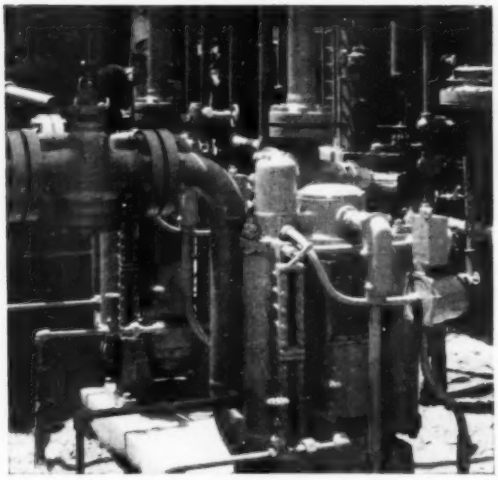
BJ's pressuring system maintains a predetermined pressure across the mechanical seal that separates the motor from the pump within the chamber. This pressure is constant, regardless of suction and discharge pressures.

NO "KEEPER" NEEDED

No special attendant is needed to guard against leakage and consequently no costly maintenance time is spent in repacking and adjusting.

OPERATING SAVINGS

While the first cost of the BJ Stuffingboxless Pump is somewhat higher, big and continuing savings are offered in operation. There's no product loss through leakage, no downtime due to flood-out.



THE *RIGHT* PUMP FOR YOUR JOB

The BJ Stuffingboxless Pump is available in a wide range of models and pressuring system combinations to meet individual requirements. Byron Jackson Co. engineers are ready to help you secure the BJ Stuffingboxless Pump best suited to your job. Write, wire or phone today.

Byron Jackson Co.

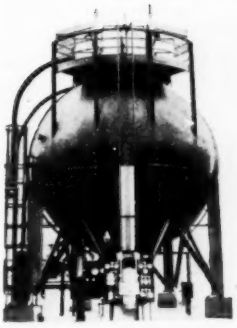
Since 1872

P. O. Box 2017 Terminal Annex, Los Angeles 54, Calif.

OFFICES IN PRINCIPAL CITIES

THESE BJ STUFFINGBOXLESS PUMPS handle ethane in a de-ethanizing operation. Pumping temperature is 80° F; suction pressure 490 psig; discharge pressure 520 psig; capacity 100 gpm; speed 3550 rpm; total head 165'; and specific gravity 0.42.

Petreco Desalting



assures maximum salt removal

which
results in
these operating
advantages...

Less crude furnace plugging
Less heat exchanger plugging
Less corrosion in topping unit

These operating advantages directly benefit the topping unit, gaining

An increased service factor
Higher temperatures to the tower
Higher charging rates
Longer runs

Also benefited is the cracking unit, mainly by

Less plugging in the reduced crude furnace

This benefits the unit by permitting

Higher temperatures from the reduced crude furnace
Longer tube life, fewer replacements
Longer runs

PETRECO MAKES SURE THAT YOU GET THE BENEFITS OF MAXIMUM SALT REMOVAL BY MAINTAINING A SERVICE ORGANIZATION WITH PERSONNEL, FACILITIES AND KNOW-HOW UNEQUALLED IN THE DESALTING FIELD

If you are charging salty crudes, and looking for some short cuts to more economical operations – get in touch with

PETROLEUM RECTIFYING COMPANY

5121 South Wayside Drive, Houston 1, Texas
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PETRECO

SPECIALIZED *Electric* PETROLEUM PROCESSES { DESALTING / DEHYDRATING

PR 50-3

Welcome to

. . . announcing . . .

the establishment of the

Climax Controls Division
of
Black, Sivalls & Bryson, Inc.

Yes, Black, Sivalls & Bryson is proud to announce to the Oil Industry that Climax Controls are now an integral part of the BS&B line. Proud of the world-wide reputation for dependable performance that Climax has earned. Proud of the modern factory where every order can be fabricated and tested swiftly. And proud most of all of the oil-smart, strategically placed Climax Sales Engineers who are ready to serve you . . . like BS&B . . . wherever oil is found.

They're on the BS&B Team now. The BS&B policy of Service to you is their policy. When you have a control problem . . . any control problem . . . in the field, transporting, storage, processing, call your BS&B Man!

BLACK, SIVALLS & BRYSON, INC.
Climax Controls Division

BLACK, SIVALLS & BRYSON, Section 2-214INS
720 Delaware St., Kansas City 6, Mo.

Please send name and phone number of nearest BS&B-Climax Sales Engineer.

Also information about controls. ☐ Ask Sales Engineer to call.

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FIRM

ADDRESS

CITY STATE

Another BS&B Step

the BS&B Team!

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SWEDE ERICKSON
Houston

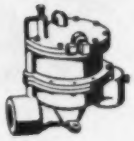
FRED O'ROURKE
New Orleans

CALVIN WINDERS
New Orleans

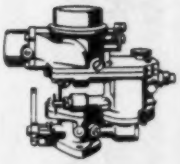
OTIS WAGUESPACK
New Orleans

to Serve the Oil Industry Even Better!

Model "Kg1"
Gas Carburetor



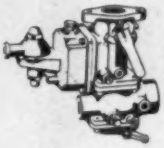
Model "B"
1 in. Regulator



Model "Cg"
Combination Carburetor

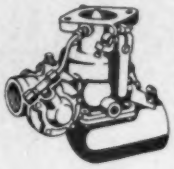
Model "F"
Regulator

Model "R" 125 H.P.
LPG Vaporizer & Regulator



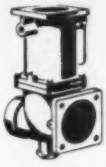
Model "Kgn1"
Combination Carburetor

Model "G1"
Gas Carburetor



Model "Xg"
Gas Carburetor

Model 2½ in. "Tg"
Combination Carburetor



Model "A"
Gas Carburetor

ENSIGN
CARBURETION

★ *First in Natural Gas*

★ *First in LP-Gas*

Complete line of Carburetors and Vaporizers

5 to 500 horsepower

•

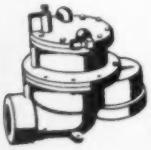
Write us for Complete Information

ENSIGN CARBURETOR COMPANY

7010 S. ALAMEDA ST., HUNTINGTON PARK, CALIF.

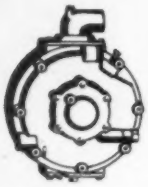
Branch Factory: 2330 West 58th Street, Chicago 36, Illinois

"Pioneers in Efficient Carburetion" • Established 1911



Model "B"
2 in. Regulator

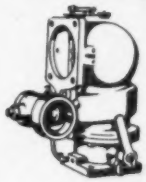
Model "W" 75 H.P.
LPG Vaporizer & Regulator



Model "S" 450 H.P.
LPG Vaporizer & Regulator

Model ¾ in. "Tg"
Combination Carburetor

Model "HD" 450 H.P.
Vaporizer



Model "Dg"
Gas Carburetor

Everything

from alloy studs

to furnaces

That's covering quite a lot of territory. But our refinery stocks are so well selected that you can get what you want merely by phoning us.

Studs and nuts, valves, fittings, hose and packing, tubular goods, expansion joints, gages, thermometers, regulators . . . these and many other commonly-needed products are available at the nearest Bethlehem Supply store. And, if it's an engineered item—such as a pump or a furnace—we can help you determine the unit that will do the best job; save you the time and expense of running it down yourself.

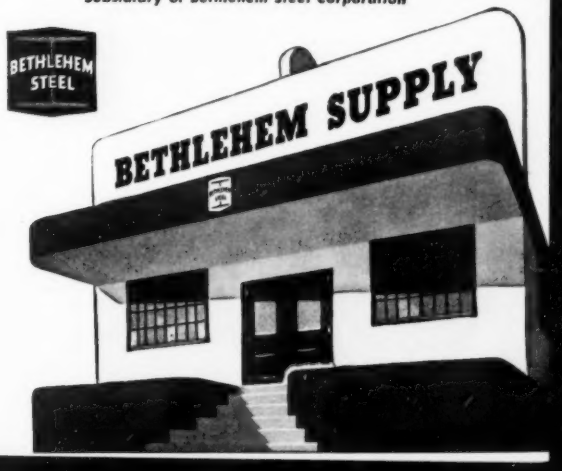
As an example, a group of six Petro-Chem Iso-Flow furnaces were specifically designed for the Maysville Plant of Warren Petroleum Corporation.

Maybe all you need today is some studs. Or maybe you're figuring something big, like an Iso-Flow heater. Whether it's big or little or in between, get Bethlehem Supply on the job.

BETHLEHEM SUPPLY COMPANY

General Offices: 21 E. Second St., Tulsa, Okla.

Subsidiary of Bethlehem Steel Corporation



HEADQUARTERS for REFINERY SUPPLIES

Ford INDUSTRIAL ENGINE Service

where you want it

Equipment builders and users of industrial engines know that one of the most important keys to profitable operations is adequate and convenient service facilities.

Your product may be outstanding in design and performance, but if your owners have to search for service, wait long periods for replacement parts—you have a *real* problem on your hands.

When you specify Ford Industrial Engines as standard power for your equipment, you have your field service problem automatically solved. For Ford Industrial Engine Service is as near as the nearest Ford Dealer—clear around the world!

And that's just one of the 3 big reasons* why smart equipment builders know Ford Industrial Engines add a real profit-plus to their applications.

*** The other two? One—the *RIGHT* power; a choice of five great engines. Two—the *RIGHT* features—the latest developments of Ford's famed progressive engineering.**

★ **Ford "226" POWER UNIT**
6 cylinder, 226 cu. in. displacement
•
(Also available in open type power unit or engine assembly only)

Ford Industrial Engines are offered as complete power units, or as individual engine assemblies. Both are available with a wide variety of special attachments. They are made in the following types and sizes:

- ★ 120 CU. IN. 4 CYLINDER
- ★ 226 CU. IN. 6 CYLINDER
- ★ 254 CU. IN. 6 CYLINDER
- ★ 239 CU. IN. V-TYPE 8 CYLINDER
- ★ 337 CU. IN. V-TYPE 8 CYLINDER

For complete specifications, call or write

INDUSTRIAL ENGINE DEPARTMENT
Ford Motor Co., Dearborn, Mich.

Send me comprehensive literature about the new Ford Industrial Engine Power Units.

Name_____
Street_____
City_____
State_____

Clip and Mail This Coupon Now!

Industrial Engine Department
FORD MOTOR COMPANY
DEARBORN, MICHIGAN

YOUR JOB IS WELL-POWERED WHEN IT'S FORD-POWERED

These are among the leading petroleum companies with Kellogg designed-and-constructed Propane Deasphalting and Decarbonizing units:

- Anglo-Iranian Oil Company, Ltd.
- British American Oil Co., Ltd.
- Cities Service Refining Corp.
- Cie. Francaise de Raffinage
- Gulf Oil Corporation
- Humble Oil & Refining Co.
- Kendall Refining Company
- Mid-Continent Petroleum Co.
- The Pennzoil Company
- Phillips Petroleum Company
- Pure Oil Company
- Shell Oil Company
- Sinclair Refining Company
- Standard Oil Company (Ohio)
- The Texas Company
- Utah Oil Refining Company

4 out of every 5 barrels of Propane-Deasphalted oil are processed in Kellogg-designed units!

Yes! Kellogg has engineered and built over four-fifths of the world's Propane Decarbonizing and Deasphalting capacity . . . and there's more under construction!

WHEN it became obvious years ago that asphalt-free crudes would not meet the growing demand for lubricating oil stocks, development work was started to obtain quality lube stocks from asphaltic crudes. Eventually this development work grew into the familiar JUIK (Jersey-Union-Indiana-Kellogg) series of propane processes, basic among which was Propane Deasphalting. First utilized successfully as a settling process in horizontally-positioned equipment, Kellogg later developed the present counter-current tower method.

Efficient, non-critical in operation, and extremely flexible over a wide range of feed and product specifications, Kellogg engineers subsequently saw in the basic principles of the process an excellent method for reducing the carbon content of cat cracker feed stock, thus increasing the potential capacity of any cat cracker. Kellogg has designed and sold such units since 1942.

As licensing agent for all such projects, and as the designer and builder of more than four-fifths of the world's capacity, M. W. Kellogg offers unduplicated background to refiners considering addition of such facilities.

PILOT PLANTS PLAYED MAJOR ROLE IN PERFECTING PROPANE DEASPHALTING!

If any refining process owes its acceptance to pilot plant work, most certainly it is Propane Deasphalting. Kellogg's first pilot plant for this process was started back in the early thirties. It was followed by others, including the latest pilot unit pictured here. Operating characteristics and economics were so thoroughly investigated on these pilot plants in hundreds of separate runs that widespread commercial acceptance of the process was achieved practically overnight on the basis of pilot plant data.

IT TAKES ALL SEVEN TO PRODUCE GREATER EARNING POWER . . .

1 THE DEVELOPMENT "TOOLS"
—laboratories, pilot plants and recognized specialists to prove and improve processing and equipment ideas.

2 PROCESS ENGINEERING
by three distinct groups of specialists—*sequence* engineers, *unit* engineers and *development* engineers—supported by an extensive reservoir of exclusive data.

3. SPECIALISTS IN EVERY PHASE
of DESIGN ENGINEERING in true depth. There are, for example, 14,000 square feet of floor space devoted to piping engineering alone . . . eight separate divisions to parallel the eight major phases of refinery engineering: piping, heat transfer, vessel and furnace, equipment, instrumentation, structural, electrical and operation. And behind this array of personnel is an exclusive compilation of data, continually created and collected during more than thirty years of the oil refining industry's greatest growth. From "Equilibrium Constants" to "Design of Piping Systems," both considered authoritative tracts within the industry, to special standardized templates for drawings, the Kellogg organization puts in the hands of its Engineering Division every necessary "tool" to deliver outstanding performance.

4 SPECIALIZED BUYERS
backed by the cumulative buying power of the largest company in the business.

5 COMPLETE FABRICATING FACILITIES
to make schedule deadlines and to develop workable "firsts" in refinery equipment.

6 CONSTRUCTION KNOW-HOW
acquired in completing hundreds of major jobs, plus an ample supply of the proper tools, and the constant development of new money-and-time-saving methods on the construction lot.

7 PRACTICAL OPERATING COUNSEL
on all design and construction, achieved through practical operating men working as an integral part of the company.

. . . AND ONLY KELLOGG HAS ALL SEVEN!

The M. W. Kellogg Company, (a subsidiary of Pullman, Inc.), New York, Jersey City, Los Angeles, Tulsa, Houston, Toronto, London, Paris

VESSEL DIVISION

NEWS

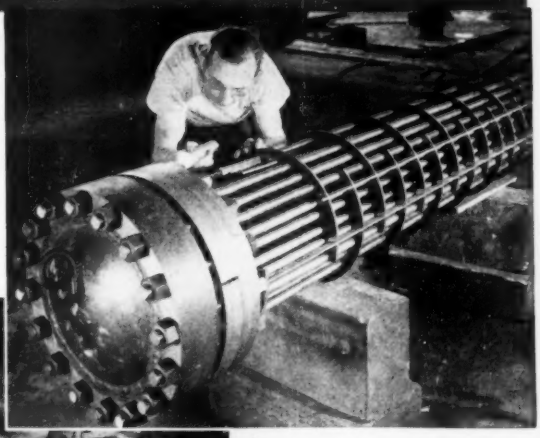
A.O. Smith 76th ANNIVERSARY 1874 - 1950

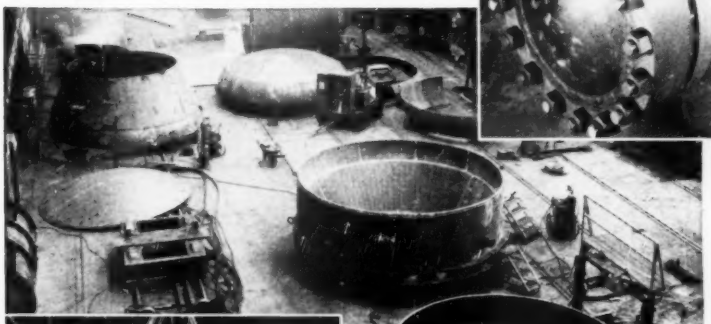
A.O.Smith

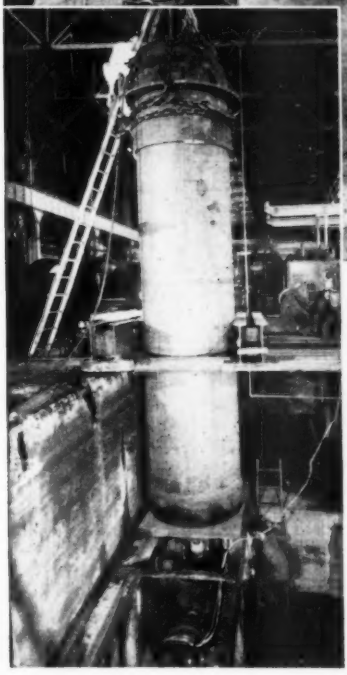
CORPORATION

New York 17 • Boston 16 • Philadelphia 3 • Pittsburgh 19 • Chicago 4
Washington 6, D. C. • Atlanta 3 • Tulsa 3 • Dallas 1 • Houston 2
Seattle 1 • Los Angeles 14 • International Division: Milwaukee 1

HEAT EXCHANGERS FOR HIGHER PRESSURES. A. O. Smith solid-backing ring construction makes the split-ring floating head safe for higher pressures. Four exchangers, like the one shown here at the right, were built for one company and tested at 1875 lb. for a working pressure of 1250 lb.







SHIPPING LIMITATIONS, PLANT LOCATIONS, OR BUILDING CLEARANCES ARE NO BARRIERS. A. O. Smith can provide field-assembled vessels built and erected to shop-quality specifications. Shown here at the left are part of the segmental cones and heads for six coke drums, each weighing approximately 220,000 lb.

MULTI-LAYER VESSEL CONSTRUCTION FOR HIGHER PRESSURES. This 24 ft. long by 4 ft. diameter lined A. O. Smith Autoclave was given a running-in test in excess of the working pressure of 2,000 psi.

A. O. Smith Corporation, Dept. OG-450
Milwaukee 1, Wisconsin

Send the latest A. O. Smith Vessel Bulletins:

- ☐ V-46: Alloy, Alloy-lined, Clad, and Glass-lined Vessels
- ☐ V-44: Field Assembly of Pressure Vessels

To: _____

Firm _____

Street _____ City _____ State _____

Now You Can Order From Stock

THE NEW EDWARD PREMIUM TYPE Fig. 444-8 SERIES

at STANDARD VALVE PRICES!

Here is a new line of forged steel globe and angle valves incorporating many features you expect only in premium-priced valves—but the new Edward Fig. 444 series is priced the same as standard valves.

And most sizes and types are available for shipment from factory stocks or from many local distributors.

Here at last is an all-purpose valve line—in either 600 or 1500 lb sp, and in sizes ¼ to 2 in.—with all the features valve buyers want most. For instance . . .

- **Simple repacking with both hands free . . .**
- **All drop forged steel for greatest strength at high pressures or temperatures . . .**
- **Tight, easily accessible bolted or union bonnet joints . . .**
- **Bronze yoke bushings to prevent stem seizing or galling . . .**
- **Low pressure loss body contours . . .**
- **Mated seats and disks checked for perfect fit on Edward Micron-O-Scope . . .**
- **EValpak heat-resistant die-molded packing . . .**
- **Screwed or socket welding ends . . .**
- **O. S. & Y. . . .**

Standardize—at standard valve prices—on the premium-type Edward Fig. 444 series. A new bulletin is ready for you.

Another Product

Edward Valves, Inc.

Subsidiary of ROCKWELL MANUFACTURING COMPANY

EAST CHICAGO, INDIANA

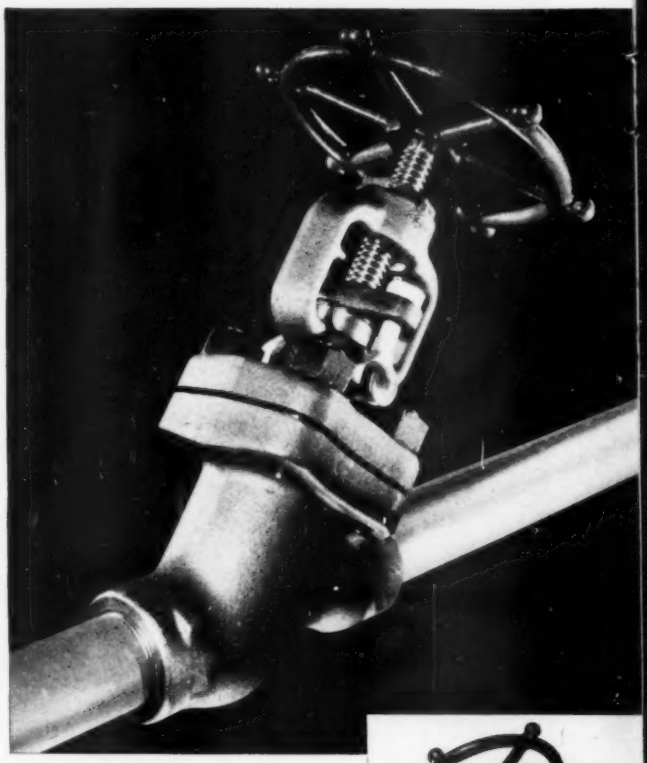
Edward Valves, Inc.
1492 West 145th St., East Chicago, Indiana

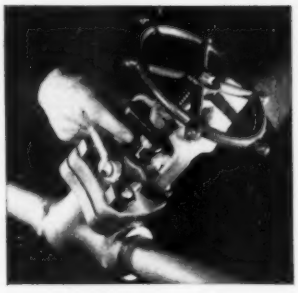
Please send me the new 501 Bulletin.

Name_____

Street_____ Zone____ State_____

City_____





MAINTENANCE MAN'S DREAM

Gland bolts swivel out of way but can't come off. Gland rests on yoke. Plenty of room between stem and yoke. Both hands free for repacking.

BONNET ASSEMBLY HAS EVERYTHING

Built-in pressure-tight backseat. Bronze yoke bushing. External threads EValized against corrosion. EValloy stainless steel stems, EValloy or Stellite seats and disks. Easy-grip non-skid handwheels.

"At last --- I've got a true LIGHT-DUTY four-wheel-drive"

"and I can mount something on the front end without butchering the truck"

" it's low enough so I can shovel into it without breaking my back"

"Now I can drive on all four wheels all the time, without undue strain on the drive line or excessive front-tire wear."

"and this 70-inch cab is as big as any on the truck market"

NEW!
Model LD
14,500 lbs.
Gross Vehicle Weight

Created for an Entirely New FWD work-range

Now you can have a *true* four-wheel-drive to completely fill the needs which *conversions* and conventional trucks have sought to answer. This new model—the LD—assures you of correct distribution of load and power, for maximum safety and economy. And—it has a *real truck engine*—so essential to efficiency for this work-range. The LD completely answers demand for an FWD in this broad field.

GET ALL THE FACTS on the LD! Ask for this folder, "The Story of the LD". See your FWD distributor or write FWD.

THE FOUR WHEEL DRIVE AUTO CO.
Clintonville, Wisconsin
Canadian Factory: Kitchener, Ont.
World-Wide Sales and Service

Built by the Makers of America's Foremost Heavy-Duty Trucks

in 1938... NEOPRENE

was used in this Shear-Relief Valve... *and it's still used!*

NEOPRENE PISTONS PREVENT LEAKAGE
Unique Shear-Relief valves protect flow line while neoprene guards against loss by leakage
Ask your supplier for NEOPRENE parts, or write us for information
DUPONT

today...

here's what this user says about NEOPRENE...

J. S. ABERCROMBIE
PRES. DENT

EDMOND L. LOREHN
VICE PRES. DENT & GENERAL MANAGER

CAMERON IRON WORKS, INC.

MANUFACTURERS OF OIL WELL SPECIALTIES
EXPORT DIVISION 74 TRINITY PLACE, NEW YORK N Y
P.O. BOX 1212 HOUSTON 1, TEXAS

February 9, 1950

E. I. du Pont de Nemours & Company, Inc.
Rubber Chemicals Division
Wilmington 98, Delaware

Gentlemen:

Sometime prior to 1938 the Abercrombie Pump Company, which has since been absorbed by Cameron Iron Works, Inc., began using Neoprene in the unique Shear-Relief Valve which we now manufacture. While minor changes have been made in design in this period, Neoprene is still used in the cushion ring of this widely used valve.

The cushion ring in this valve performs a dual function. When the valve opens it must absorb the shock of the stem and piston striking against it, and it must also prevent leakage around the stem during the time that the valve is open.

Years of field experience have proved Neoprene to be entirely satisfactory for this service since it tends to retain its physical properties and resilience, even under the deteriorating effects of oil and gas.

Very truly yours,

CAMERON IRON WORKS, INC.

Madden T. Works
Chief Engineer

12 YEARS AGO the Abercrombie Pump Company, which has since been absorbed by Cameron Iron Works, Inc., used Du Pont neoprene to protect their shear-relief valve against fluid loss. They chose neoprene because it had to remain resilient and resist the deteriorating effects of high pressure oil and gas for the entire life of the valve. They still report complete satisfaction with neoprene's performance in this equipment.

Neoprene's excellent properties can be compounded in a wide variety of combinations to meet specific requirements. Wherever neoprene is used, it provides resistance to extreme temperatures, weathering, constant flexing, aging and abrasion. And neoprene stands up under contact with oils, grease, acids and most chemicals. So check neoprene's many outstanding advantages next time your equipment requires rubber in any form. You'll find that neoprene assures you of long, dependable service and lower maintenance cost. While Du Pont does not make finished products of neoprene, we'll gladly help you find a supplier. Write to E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division, Wilmington 98, Delaware.

NEOPRENE

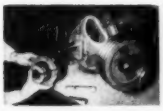
The rubber made by Du Pont since 1932

DUPONT

These Features Save You Money	For These Reasons	It's a Worthington—
1 Two-piece QD sheave—rim and hub separate	Mount light hub first, then slide heavier rim on tapered hub	EXCLUSIVE
2 Choice of one or two-piece assembly	Mount hub and rim separately, or loosely assemble hub on rim and slide on shaft together	EXCLUSIVE
3 Split hub	Easy to mount, even on oversized shaft	ORIGINAL
4 Clamp screw in hub	Holds hub in position on shaft while setting or removing rim	EXCLUSIVE
5 Taper-mated hub and rim	Mount easily in any position—no keyway between taper surfaces	ORIGINAL
6 Large, long pull-up bolts	Hold better and more uniformly	EXCLUSIVE
7 Friction cone grip	Tightening rim on hub gives positive press fit on shaft	ORIGINAL
8 Shaft key lock (set screw over keyway)	Prevents key from drifting	EXCLUSIVE
9 Quickly-detachable (QD)	Pull-up bolts used as jack screws to remove sheave rim	ORIGINAL
10 Interchangeable rims	Hubs for every bore—lower inventory cost	ORIGINAL
11 No realignment problem	Clamped hub holds shaft position—new rim tightens up in exact alignment	EXCLUSIVE
12 Choice of "A", "B", "C" and "D" grooves	"Tailor-made" grooves give proper belt "ride-out" for maximum life efficiency	ORIGINAL
13 I-beam spokes on driven sheave	Stronger—capable of carrying heavier load with less weight	EXCLUSIVE
14 Offset design of sheave	Reduces over-hang loads—increases bearing life	ORIGINAL
15 Worthington-Goodyear V-belts	Load-carrying cords in neutral axis reduce internal friction—each belt carries its share of drive load	ORIGINAL

How Does Your Drive Rate on the V-drive Scoreboard?

Here are 15 money-saving features of the most efficient V-belt drive. Only Worthington Multi-V-Drives give you all 15!



EASY TO GET ON

EASY TO GET OFF

YET ALWAYS TIGHT ON THE SHAFT

WORTHINGTON QD SHEAVE
—ORIGINAL TAPERED CONE-GRIP SHEAVE

Complete Range of Stock Sizes — Prompt Shipment. 853 listed stock sizes in "A", "B", "C" and "D" sections, fhp to 200 hp . . . 332 listed stock sizes of EC Cord V-belts. *Send coupon for latest Worthington QD Sheave bulletin.*

WORTHINGTON

ORIGINATORS OF THE QD SHEAVE
WORTHINGTON PUMP AND MACHINERY CORPORATION
MULTI-V-DRIVE SALES DIVISION
Buffalo, N. Y. · General Offices, Harrison, New Jersey
POWER TRANSMISSION: sheaves, V-belts, variable speed drives
PUMPS: centrifugal, power, rotary, steam
AIR COMPRESSORS: water-cooled, air-cooled

The Good Right Hand of Industry

Worthington Pump and Machinery Corporation
Multi-V-Drive Sales Division, Dept. PO-1
Buffalo, N. Y.

Send latest bulletin of Worthington Multi-V-Drives.

NAME.....

COMPANY.....

ADDRESS.....

CITY.....ZONE.....STATE.....

it's NATIONAL SEAMLESS CASING

THAT rugged casing in the above picture has an interesting background. Right from the preparation of the mix, the steel for this casing has been treated with the utmost care and skill possible.

The reason for this is simple—only the most precise metallurgical control will assure steel that will meet National Tube standards. For our method of seamless manufacture—actually piercing a billet of steel—is one of the most drastic forging operations in the steel industry. Only the very best steels can withstand this test—the basic operation in the production of NATIONAL Seamless Drill Pipe, Casing and Tubing.

All the special care we take, to make sure the steel is right, is fully justified by results. The records of NATIONAL Seamless show performance unsurpassed by any other kind of pipe or tubing—superior performance characterized by higher collapse resistance and increased joint strength . . . quick, easy stabbing . . . smooth make-up . . . tight joints. And remember: NATIONAL Seamless has no welds, no seams, nothing to weaken or injure the tube.

Write today for information. Address National Tube Company, Frick Building, Pittsburgh 19, Pa. Ask for Bulletin 15, "Seamless Drill Pipe, Casing and Tubing."

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

TWO EXCLUSIVE FEATURES THAT MEAN BETTER NATIONAL SEAMLESS CASING

DEOXIDIZED BESSEMER STEEL — has the superior forging qualities necessary for seamless pipe manufacture. Its high yield strength and good ductility mean greater toughness . . . greater collapse resistance. Produced in A.P.I. H-40 and J-55 grades.

WARM-WORKED CASING — superior to cold reduction, warm working imposes less stress on the metal . . . permits it to be stress-relieved as it cools. Result: higher collapse resistance, increased joint strength. Furnished in A.P.I. N-80 grade.

WALLS WITHOUT WELDS

USS

NATIONAL SEAMLESS

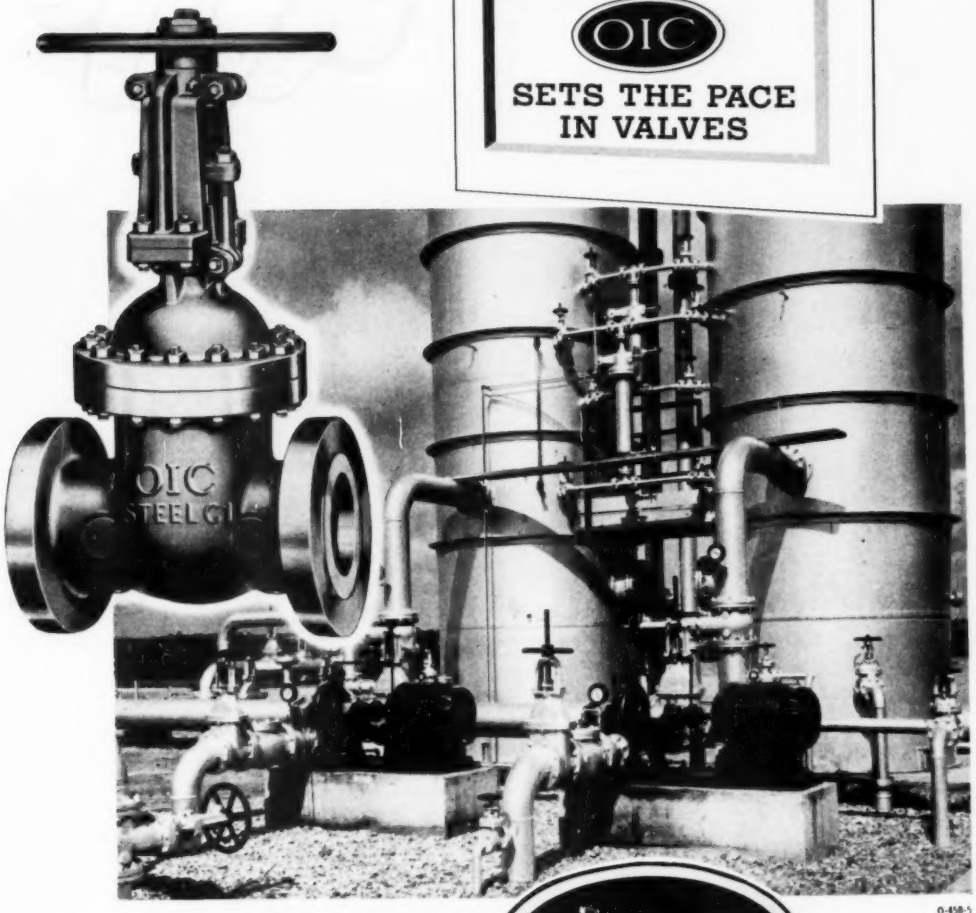
drill pipe . . . casing . . . tubing

UNITED STATES STEEL

Serving

THE PACE-SETTERS OF THE PETROLEUM INDUSTRY

OIC
SETS THE PACE
IN VALVES



0-450-5

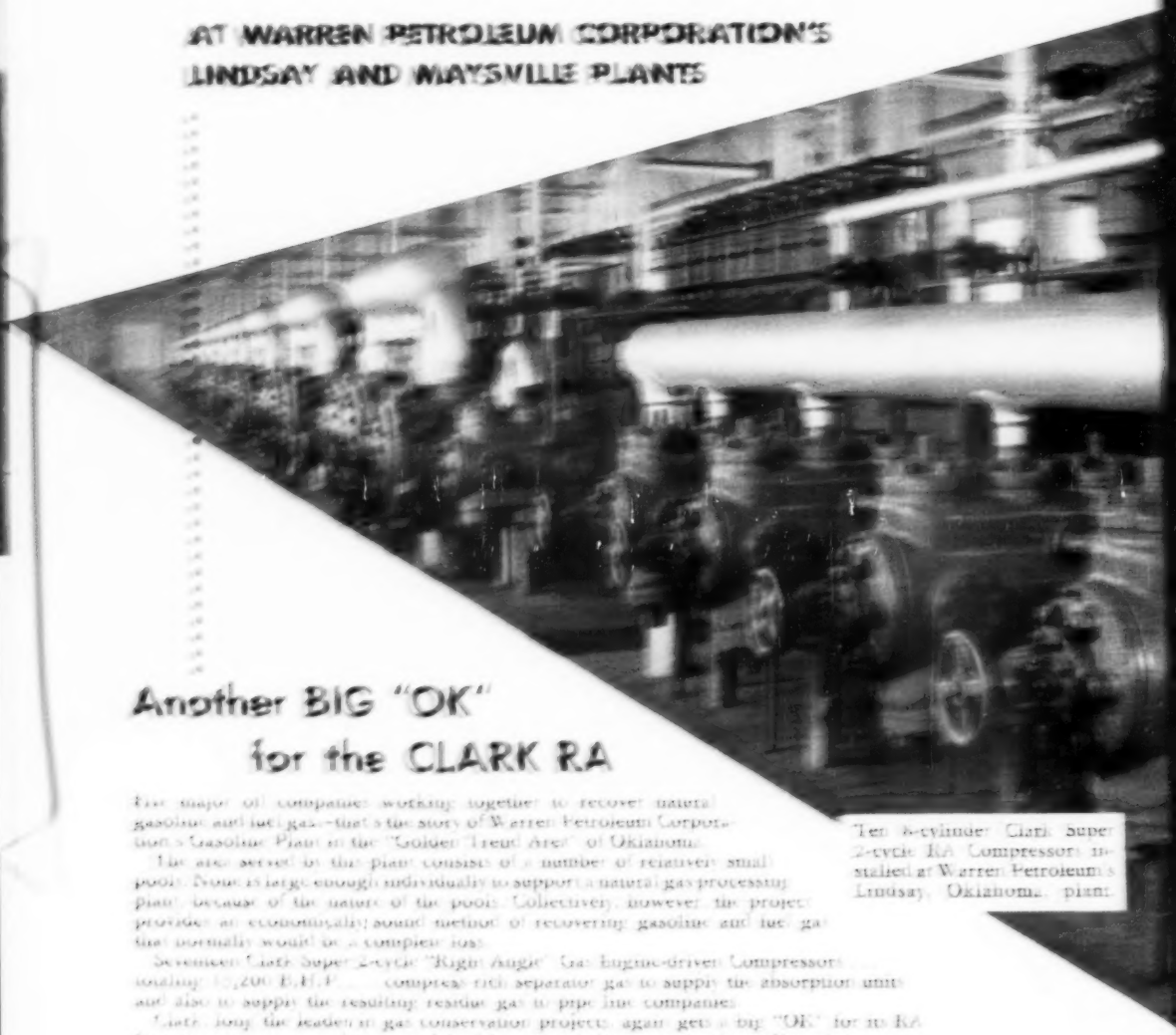
SINCLAIR OIL & REFINING COMPANY
is using these and other OIC Valves at its Pressure Maintenance plant at Santa Barbara, Venezuela. To keep pressures constantly high, OIC Gate valves permit straight-through *free* flow when wedges are fully open, reduce turbulence, eliminate excessive pumping costs. Start your investigation of the pace-setting line today. See your local OIC distributor. Write for your free copy of the new 1950 Valve Cross Reference Chart, for information on the right OIC figures to replace your present valves.

THE OHIO INJECTOR COMPANY
180 S. Lyman St., Wadsworth, Ohio

OIC
VALVES
FORGED STEEL • CAST STEEL
IRON • BRONZE

13,200 INSTALLED HORSEPOWER

AT WARREN PETROLEUM CORPORATION'S LINDSAY AND MAYSVILLE PLANTS



Ten 8-cylinder Clark Super 2-cycle RA Compressors installed at Warren Petroleum's Lindsay, Oklahoma, plant.

Another BIG "OK" for the CLARK RA

Five major oil companies working together to recover natural gasoline and fuel gas—that's the story of Warren Petroleum Corporation's Gasoline Plant in the "Golden Trend Area" of Oklahoma.

The area served by this plant consists of a number of relatively small pools. None is large enough individually to support a natural gas processing plant because of the nature of the pools. Collectively, however, the project provides an economically sound method of recovering gasoline and fuel gas that normally would be a complete loss.

Seventeen Clark Super 2-cycle "Right Angle" Gas Engine-driven Compressors totaling 13,200 B.H.P. compress rich separator gas to supply the absorption units and also to supply the resulting residue gas to pipe line companies.

Clark long the leader in gas conservation projects again gets a big "OK" for its RA Compressors now being used in this country's largest natural gasoline plants.

Write for Literature—May we send you complete literature on other major natural gasoline plants? Clark Bros. Co., Inc., Olean, New York.

Selected jointly by The Carter Oil Company — Warren Petroleum Corporation
The Texas Company — Cities Service Oil Co. — J. E. Grotlisch, Inc.

CLARK COMPRESSORS

ONE OF THE DRESSER INDUSTRIES

New York • Tulsa • Houston • Chicago • Boston • Washington • Los Angeles • Birmingham • Detroit
Salt Lake City • San Francisco • • • • London • Buenos Aires • Caracas, Venezuela
Paris • Bucharest • Lima, Peru • Bogota, Colombia • New Delhi, India

Here's an "8-Hour Day" Safety Goggle...

it's LIGHT, ATTRACTIVE, COMFORTABLE

AO Plastic Goggle

For day-long wear—day in and day out—the AO607 Goggle combines light weight, good looks and comfort with its safety function. It can be worn directly over eyes or spectacles for frontal protection on machine or hand tool work, chemical and physical lab work, bottling operations, spot welding, light grinding, chipping, and riveting. Comes with handsome leatherette case. Your nearest AO Safety Products Representative can supply you.

QUICK FACTS

PLASTIC FRAME is light but durable. High set end pieces for unobstructed side vision. No metal touches skin. Face form of frame gives extra protection, enhances appearance.

ACETATE LENS (clear or green) is large, one-piece, shatter-resistant and easily replaceable. Provides exceptional vision in front and laterally. Broad bearing surfaces make nose pads unusually comfortable.

COMFORT CABLE TEMPLES have metal core for easy adjustment, snug fit. Enclosure in acetate prevents corrosion. Permanently sealed at tip and joint.

This goggle conforms to high safety and optical standards in every way.

American Optical
SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts • Branches in Principal Cities

IN ALL THE WORLD... NO WRENCH LIKE

ROXCO

it's individually **REGISTERED** *completely* **GUARANTEED!**

Special MONEY-BACK TRIAL OFFER!

Buy *one* "Registered" Roxco and use it for your toughest jobs. If you don't agree it stands up better . . . is handier, faster to use . . . is a bigger value than any pipe wrench you've ever used . . . return *that one* trial Roxco direct to us (not the seller), within sixty days with a note of price paid and reason for returning. We will refund your money. This get-acquainted offer good until Dec. 31, 1950. Trimont Mfg. Co., Roxbury, Mass.

ENGINEERED BY STRESS ANALYSIS TO ASSURE HEAVY DUTY STRENGTH WITHOUT USELESS WEIGHT

See dark Hardened area

Now you need not accept useless, fatiguing weight in order to get a dependably strong wrench. Through stress analysis of every inch, the new Roxco was designed to put *extra* metal *where heavy stresses come.* And, to take out metal where it does *not* count.

The result is not only the handiest pipe wrench a man ever put to work, but also a wrench so strong that it exceeds, by a good margin, Federal Spec's for Heavy Duty Pipe Wrenches, Type II, GGG-W-651a.

So superior is this new wrench . . . so carefully quality-controlled . . . that every Roxco is individually *Registered* by number. And *every* part is *guaranteed* against breakage in any normal heavy duty use! The nine points below show why any wrench buyer and user will want the lighter, easier-to-work-with Roxco to boost efficiency . . . reduce tool costs. Order Roxco, now. Or send for folder and names of distributors.

1. Extra Strength Based on Stress Analysis: Extra metal at critical points provides higher resistance to failure. Protects work and worker. Withstands unusual stress in "side pull".

2. Lighter Weight Achieved: Stress analysis also showed where useless metal could be eliminated to produce a lighter, handier wrench.

3. Uniformity of Jaw Hardness and Strength: Both movable and insert jaws are of drop-forged alloy steel. Teeth are hardened by automatically-timed, localized induction process at wear points, yet the tough core of jaws is retained for strength.

4. Reinforcing Shoulder Behind Insert Jaw resists any unusual stress. Assures long, trouble-free service.

5. Rapid Ratcheting Action: New, simplified cushion action replaces complicated spring. With Roxco tooth design, it prevents seizure on pipe and permits fast ratcheting action — as fast as user can move his hand. Accurate fit of assembled parts eliminates lost motion — speeds jobs.

6. Comfort-Shaped, Palm-Fitting Handle: New wide handle design is more comfortable to use — makes work easier, cuts worker fatigue.

7. Reinforced Housing embodies a hammer face to break cast fittings.

8. Handy, Accurate Pipe Scale permits quick adjustment to desired size.

Special Metallurgical Formula: Roxco Metal, combined with scientific heat treating, means superior strength in housing and handle.

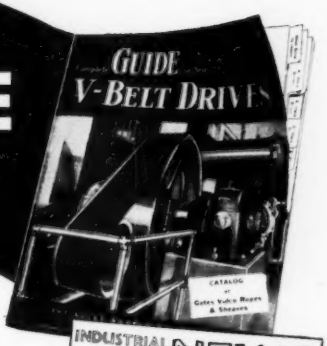
TRIMO-ALLOY WRENCH . . . Roxco's only Rival . . . is an all alloy-steel heavy duty pipe wrench. Different in design, but has power comparable to Roxco.

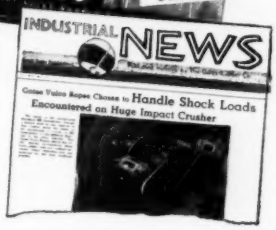
TRIMONT MANUFACTURING CO. Division of Aetna Industrial Corporation, 55 Amory Street, Roxbury 19, Mass. Makers of Wrenches, Pipe Cutters, Vises and Other Trimo Time-Tested Tools.

These Two Valuable "Tools" of

V-BELT DRIVE

Design and Application





. . . are *Yours* for the *Asking!*

The Gates "GUIDE for SELECTING or DESIGNING V-BELT DRIVES" is widely recognized as the most *comprehensive* and *complete* book of its kind—and also the *easiest to use.* It enables you to find all the possible combinations of stock drives for your machine with the *least amount of calculation*—and almost *automatically* gives you the drive of *lowest price* that will be adequate for the job.

Saves You Time, Work and MONEY

The GUIDE tells all about "Design Horsepower" and Speed Ratios—and by merely *scanning* a page of GUIDE designs which use the *stock pulleys* that meet your needs, you can quickly determine the center distances that will fit your equipment layout while, at the same time, enabling you to use *standard belts!*

You Can Design ANY Drive

The Gates GUIDE tells *when* you can use a *V-Flat* drive—and gives you a simple way to choose a practical V-Flat design using *stock* driver sheave with whatever flat pulley you may already have on hand.

As a matter of fact, by using the Gates GUIDE you can design—with a *minimum of calculation*—*any kind* of V-Belt drive for every kind of operation—including quarter-turn drives and Dubl-V drives.

Written By GATES Engineers

The GUIDE is compiled and written by Gates Engineers. It embodies their specialized knowledge gained through operating the largest V-Belt testing laboratories in the world! Here, an average of *32,000 hours* of testing *per week* are run on V-Belts alone! No wonder the Gates "GUIDE for SELECTING or DESIGNING V-BELT DRIVES" is regarded by Engineers as the *authority* on V-Belt Drive design.

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Eng. 501

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EXTREME FLEXIBILITY
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easy maintenance

Brown Fintube Design Simplifies Inspection and Maintenance

● Brown Fintube Sectional Hairpin Heat Exchangers reduce maintenance three ways:—

1st. BY MINIMIZING COKING. The much increased surface area permits efficient operation at low "skin" temperatures, minimizing coking and building up on the tubes.

2nd. AVOIDING BACK EDDIES. The controlled flow through the longitudinal passages keeps all the material in continuous motion, avoiding baffles, back eddies, and stagnant areas that cause fouling.

3rd. EASY TUBE REPLACEMENT. A fintube hairpin can be taken out of the shell, and a clean hairpin substituted, by only 2 men, in less than 10 minutes, using only ordinary tools and *no special rigging.*

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THE BROWN FINTUBE CO.
ELYRIA, OHIO

SECTIONAL HAIRPIN HEAT EXCHANGERS

The California Company's

Horizontal Dehydration Unit

Dries Natural Gas with

ALCOA *Activated** *Alumina*

This unique dehydration unit at the California Company's Hico-Knowles Plant near Dubach, La., was designed to reduce back pressure by shortening the flow through the desiccant. Forty to fifty million cubic feet of natural gas are dried daily to *minus* 18° F. dew point. Entering the vessels at 100° F. and 900 psig, gas flows vertically through 3' x 30' horizontal desiccant beds containing 30,000 lbs. of ALCOA *Activated* Alumina. Regeneration is accomplished on a 12-hour cycle by natural gas heated to 325° F.

Throughout the petroleum industry, you'll find ALCOA *Activated* Alumina doing steady, reliable dehydrating jobs similar to this one, for a variety of good reasons.

ALCOA Activated Alumina:

- dries liquids and gases to a lower dew point than any other commercial adsorbent.
- is a uniformly pure desiccant that retains its form and properties even after an almost unlimited number of regeneration cycles.
- has high resistance to shock, abrasion and erosion . . . is non-toxic and inert to most gases and vapors.
- packs uniformly . . . will not swell, soften or disintegrate.

Whatever your drying problem, it will pay you to write to ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 618D Gulf Building, Pittsburgh 19, Pa.

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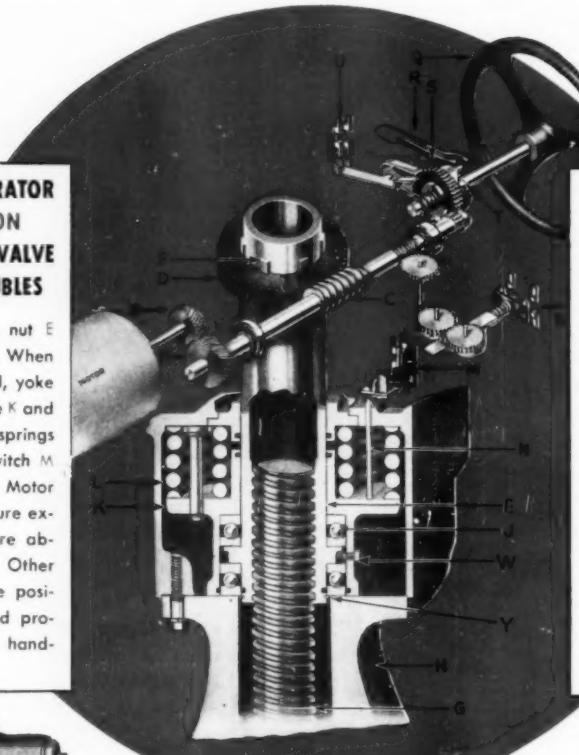
BETTER...SAFER...SURER
VALVE OPERATION
FOR EVERY PETROLEUM INDUSTRY NEED

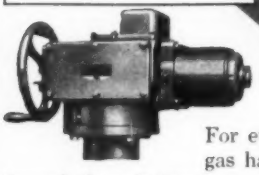
THE VALVE OPERATOR CONSTRUCTION THAT PREVENTS VALVE JAMMING TROUBLES

Motor drives yoke nut E thru A, B, C, D and F. When valve disc is seated, yoke nut rises, lifting plate K and rod N, compressing springs L and operating switch M which stops motor. Motor drift, and temperature expansion of stem, are absorbed in springs. Other elements shown are position limit switch and provision for optional hand-wheel operation.



Features of
C-H CONTROLLED THRUST VALVE OPERATORS

- Provides tight closure under normal operating conditions, eliminating any need for "final" seating.
- Provides for large temperature changes in high temperature steam valves and gas valves. No periodic "back off" necessary. No dismantling of valve to "unfreeze" the parts.
- Provides for accurately controllable full power drive, easily adjusted for service conditions. Reduces strain and wear and tear resulting from other systems.
- Provides high speed operation on high pressure valves as well.
- Provides ADEQUATE Protection for low pressure valves . . . against high forces, against artificial obstructions such as gravel, a piece of wood, etc., in the valve.
- Delivers an unseating "hammer blow."
- Free hand-wheel operation available at any time. Protected against simultaneous electrical operation.



For every problem of oil and gas handling from production through the refining processes and out across the pipe line networks, the *controlled thrust* principle of Cutler-Hammer Motorized Valve Operators gives these definite advantages for all kinds of valves:

It *always* assures a tightly seated valve regardless of the frictional condition of the valve stem or the driving mechanism.

It *definitely* prevents damage to a valve from the expansion and contraction of valve parts under extremes of temperature.

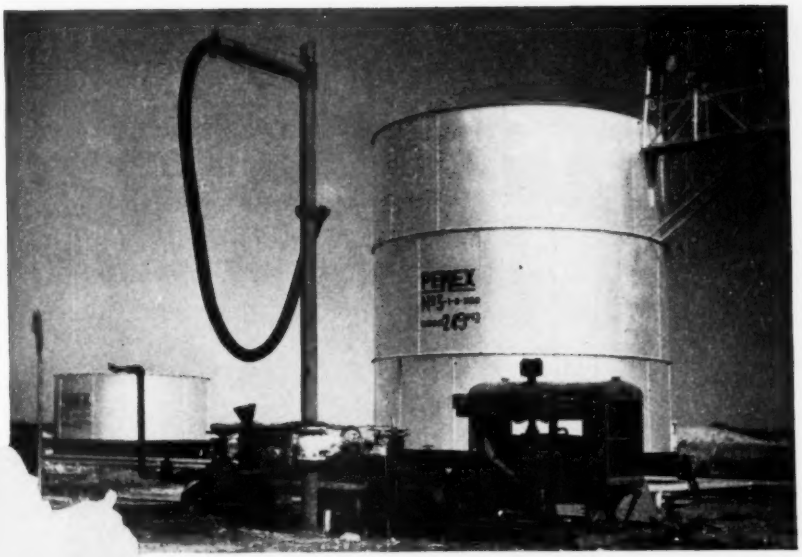
It *unfailingly* provides correct seating no matter how swiftly the valve is closed, and it prevents damage in case foreign matter lodges in the valve.

Cutler-Hammer *controlled thrust* Valve Operators gain their superiority through what may be called a transferable fulcrum. They drive through a yoke nut fulcrum established by heavy steel springs whose compression is equal to the desired tight seating pressure. When the valve is accurately seated, the *seat* becomes the fulcrum, the yoke nut retracts, opening the motor circuit, and motor drift is absorbed by the springs. Moreover, the same accurate seating is maintained as valve parts expand and contract.

Now is the time to investigate this proven superior motorized valve operator for your needs. Available as standard equipment on all leading makes of valves . . . . . CUTLER-HAMMER, Inc., 1453 St. Paul Ave., Milwaukee 1, Wis.

CUTLER-HAMMER
VALVE CONTROL
C-H

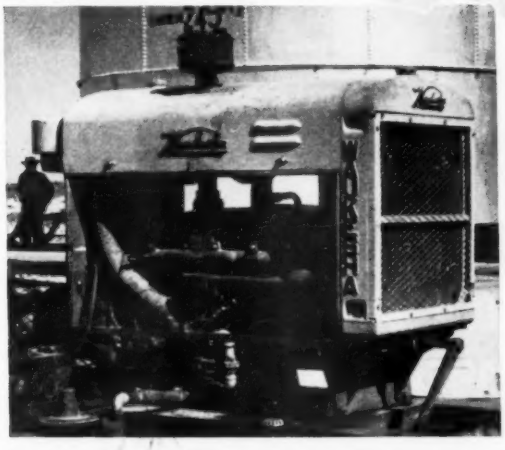
Photos by Mary St. Albens
Mexico City



SOUTH of the BORDER . . .

WAUKESHA powers the pumps

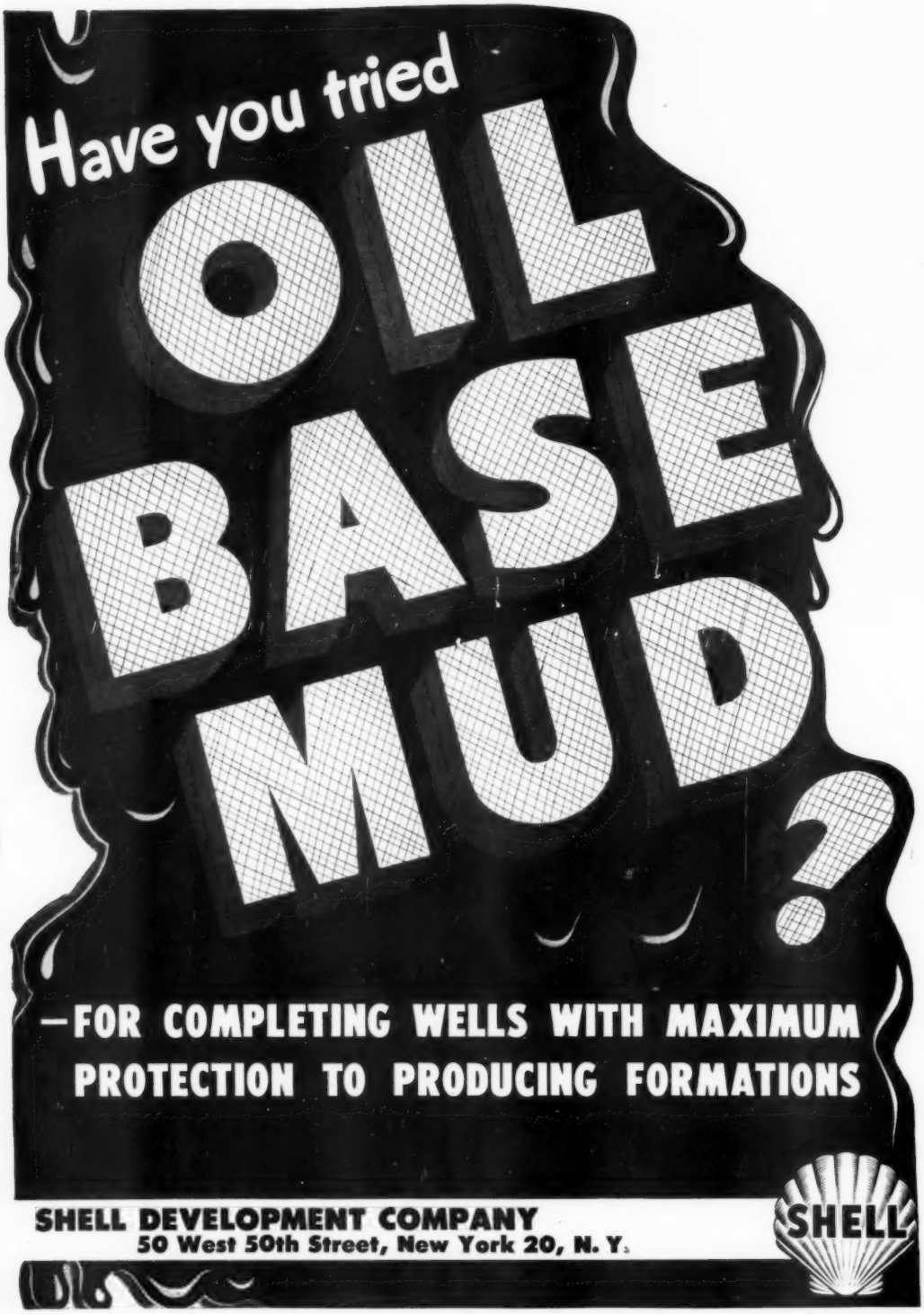
Waukesha 6-MZAU Oil Field GAS POWER UNIT— 60-80 hp.—6-cyl., 4¼-in. bore x 4¾-in. stroke, 404 cu. in. displacement.



● Handling crude oil from stock tanks to trucks for delivery to the refinery in the Reynosa field in the State of Tamaulipas, Mexico—the Worthington pump is direct-connected to a Model 6-MZAU Waukesha Power Unit burning natural gas. In any oil field . . . South of the Border . . . or North . . . look for Waukeshas at work. In this unit the thousands of oil field horsepower-hours back of its dependable design make it rugged and reliable in service. A power plant of 404 cu. in. displacement, with 4¼-in. bore and 4¾-in. stroke, the six-cylinder MZAU Waukesha Power Unit will deliver 58 hp. continuously under full load. Maximum output is 86 hp. at 2200 rpm. It's all real horsepower—sure, solid and smooth. In the engine's design, the combination of the Waukesha Manifold and Controlled Turbulence Combustion Chamber not only increases power and torque output, but betters fuel economy. Details in Bulletin 1408. And for the entire Waukesha Power line, send for Bulletin 1079.

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.
NEW YORK • TULSA • LOS ANGELES

WAUKESHA ...Gas Power
Diesel Power... POWER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OIL BASE MUD?
—FOR COMPLETING WELLS WITH MAXIMUM PROTECTION TO PRODUCING FORMATIONS
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IT'S EASY TO CARRY—weighs only 44 pounds. The case is only 19¾" long, 10⅝" high, and 9¼" deep.

IT CAN BE SET UP ANY PLACE where there's a 115-volt, a-c supply—forestry, utilities, construction projects, etc.

IT'S IDEAL for 2-way operation (police, fire, etc.) in small and medium-size municipalities requiring medium-range communication equipment.

For *portable or fixed* station use

. . . the RCA Carfone Station Unit "15"

THIS is the most versatile 2-way radio station ever designed for medium-range communication. It is complete with transmitter, receiver, power supply, portable antenna, handy microphone, and loud speaker—*all in a single package.*

Easy to carry and easy to set up, this portable unit can be operated wherever there is a 115-volt, a-c outlet.

For fixed station use, place the unit on the operating desk, hook-up the antenna, plug in the power cord, and you're set to go. For portable station use, simply connect the quarter-wave, whip antenna (supplied) and plug in the power cord. No extra components to carry around. No installation expense involved.

Greatly improved receiver selectivity reduces adjacent channel signals well below interference levels. A newly-designed transmitter modulation control enables you to transmit the full signal potential of the transmitter and maintain 100 per cent modulation at virtually all voice levels—*whether you shout or whisper into the microphone.*

For complete information on the new RCA Carfone Station Unit "15", write Dept. 122-D. RCA Engineering Products, Camden, New Jersey.

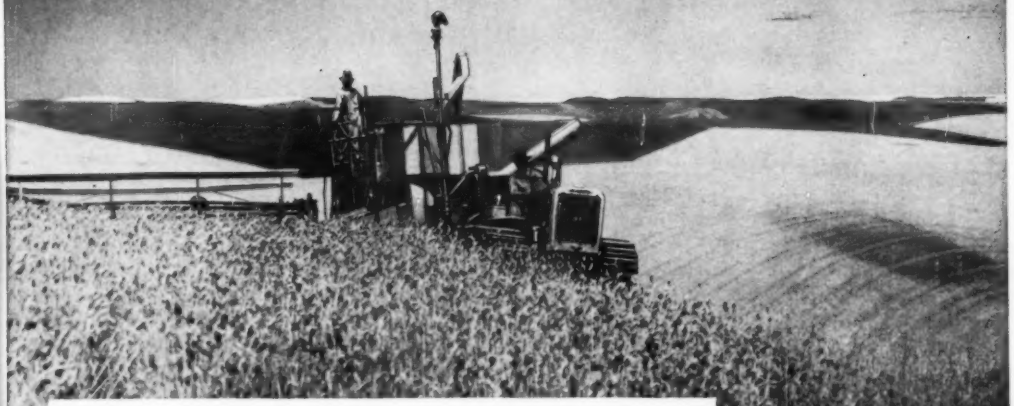
RCA

MOBILE COMMUNICATIONS SECTION
RADIO CORPORATION of AMERICA
ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.

In Canada: RCA VICTOR Company Limited, Montreal

PLOWING BACK PAYS OFF

TODAY, IN OIL AS IN FOOD—All America Reaps the Benefits of Planning Ahead!



DURING and after the war, as everyone knows, oil needs skyrocketed. They are still climbing.

In 1948, Socony-Vacuum plowed back $201,000,000 into the business — expanded all facilities to handle unprecedented demand.

Again, in 1949, we plowed back $158,000,000 to improve still further our efficient, integrated operation, and so assure a continuous flow of high-quality oil products.

This is the kind of "plowing back" that builds for the future . . . that makes for National Security . . . that assures oil supply for growing millions of cars, homes and mechanized farms, for expanding aviation and *every* industry that relies on *more oil* to produce a bigger money's-worth for you.

America is already reaping the benefits, and more and more benefits are coming.

* * *

Socony-Vacuum, as one of the oldest petroleum companies, is proud of the part it has played in a progressive industry — will continue to look ahead and plow back.

The Flying Red Horse Companies

SOCONY-VACUUM OIL COMPANY, INC.

and Affiliates: MAGNOLIA PETROLEUM CO. • GENERAL PETROLEUM CORP.

The Sign the Nation Knows — Builds as the Nation Grows!

SOCONY-VACUUM

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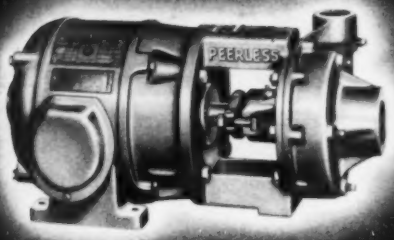
BOILER, CONDENSER AND HEAT EXCHANGER TUBES

DURABLE • ECONOMICAL • GENERAL UTILITY PUMPS FOR ALL ORDINARY LIQUID PUMPING SERVICES

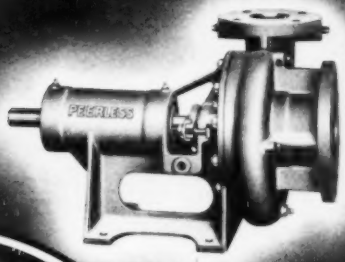
THE PEERLESS *Fluidyne* LINE

CLOSE-COUPLED TYPE *Integral H. P.*



Type PE MOTOR SIZE: 1-40 H.P.
CAPACITY: Up to 5500 gpm
HEADS: Up to 270 Feet

BELTED OR DIRECT-CONNECTED TYPE *Integral H. P.*



Type PB MOTOR SIZE: 1-40 H.P.
CAPACITY: Up to 5500 gpm
HEADS: Up to 270 Feet

PEERLESS PUMPS

COMPLETE RANGE OF SIZES FROM ¼ TO 40 H.P.

CAPACITIES: UP TO 5500 G.P.M. • HEADS: UP TO 270 FEET

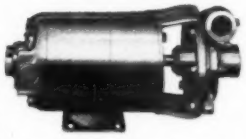
Want compactness? Want efficiency? Want durability? Want economy? You can have them all by using pumps in the versatile and complete line of Peerless Fluidyne general-purpose pumps. Versatile, because they can be applied to a host of diversified services calling for transfering of liquids such as water for air conditioning or cooling and refrigeration systems, mild alkaline solutions, booster service, process uses and many others. Complete, because they offer widest range of sizes and models. The Type PE Fluidyne pump, a close-coupled bracket-type pump is electric drive, available from ¼ to 40 h.p. It is direct-connected to standard NEMA electric motors. The Type PB offers the same wide h.p. range but differs from the PE in that it is built to receive standard V or flat belt pulleys for engine drive, or it can be mounted on a common base with an electric motor and driven by a flexible coupling.

Both Type PE and Type PB Fluidyne pumps are single stage, end suction, centrifugal design. Simplicity and quality and ruggedness are inherent in their design. All parts are easily accessible. Close attention to hydraulic characteristics has resulted in pumping units of high efficiency. Disassembly and assembly for inspection or maintenance is rapid.

Fluidyne pumps operate with unimpaired efficiency in any position—vertical, horizontal or intermediate angle. All parts of exacting Peerless manufacture found only in highest quality pumps. Evidence of their high quality is found in features such as high strength cast bronze streamflow impellers, replaceable bronze wear rings on pump case, oversize packing, drain pocket, ball bearings (PB unit), precision alloy steel shafts.

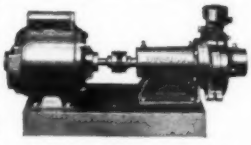
You can probably visualize a score of uses for these dependable, economical pumps. Write today for bulletins describing and illustrating Peerless Fluidyne pumps in the size and type you require.

FRACTIONAL HORSEPOWER CLOSE-COUPLED TYPE PE



¼ to 1 h.p. • 3450 rpm • 60 cycle
Capacity: To 50 gpm • Heads: To 90 Ft.

DIRECT OR BELTED TYPE PB FRACTIONAL HP COMMON BASE



¼ to 1 h.p. • 3450 rpm • 60 cycle
Capacity: To 50 gpm • Heads: To 90 Ft.

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION

Factories: Los Angeles, California, and Indianapolis, Indiana
Offices: New York, Atlanta, Fresno, Los Angeles, Chicago, St. Louis, Phoenix; Dallas, Plainview and Lubbock, Texas.

MORE POWER *than ever!*
GREATER VALUE *than ever!*

Again in 1950, Chevrolet is the outstanding leader in the entire truck field! Chevrolet brings you more power —and more value—than ever before. *These 1950 P•L trucks are the most powerful trucks Chevrolet has ever built!*

Chevrolet—and only Chevrolet—leads the field in popularity, performance, payload and price. Chevrolet —and only Chevrolet—has earned the right and proved its right to leadership.

See your Chevrolet Dealer today. He sells a P•L truck for every trucking job. And every one gives you MORE POWER . . . GREATER VALUE . . . than ever!

CHEVROLET MOTOR DIVISION, *General Motors Corporation*
DETROIT 2, MICHIGAN

Out in front with all these PLus *Features:*

• **TWO GREAT VALVE-IN-HEAD ENGINES:** the New 105-h.p. Load-Master and the improved 92-h.p. Thrift-Master—to give you greater power per gallon, lower cost per load • **THE NEW POWER-JET CARBURETOR:** smoother, quicker acceleration response • **DIAPHRAGM SPRING CLUTCH** for easy action engagement • **SYNCHRO-MESH TRANSMISSIONS** for fast, smooth shifting • **HYPOID REAR AXLES**—5 times more durable than spiral bevel type • **DOUBLE-ARTICULATED BRAKES**—for complete driver control • **WIDE-BASE WHEELS** for increased tire mileage • **ADVANCE-DESIGN STYLING** with the "Cab that Breathes" • **BALL-TYPE STEERING** for easier handling • **UNIT-DESIGN BODIES**—precision built.

CHEVROLET
P*•L*
ADVANCE-DESIGN TRUCKS

P*opularity L*eaders

The public's overwhelming preference for Chevrolet trucks is proof of owner satisfaction earned through the years. Beyond question, Chevrolet P•L trucks are the nation's leading choice in the entire truck field.

P*erformance L*eaders

The new Chevrolet P•L trucks give you high pulling power over a wide range of usable road speeds—and on the straightaway, high acceleration to cut down total trip time.

P*ayload L*eaders

The rugged construction and all-around economy of Chevrolet P•L trucks cut operating and repair costs—let you deliver the goods with real reductions in cost per ton per mile.

P*rice L*eaders

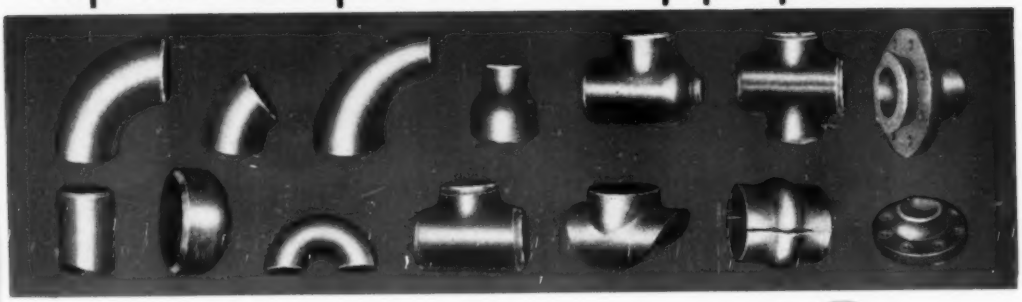
From low selling price to high resale value, you're money ahead with Chevrolet trucks. Chevrolet's rock-bottom initial cost—outstandingly low cost of operation and upkeep—and high trade-in value—all add up to the lowest price for you.

CHEVROLET

MIDWEST

Welding Fittings

improve design and reduce piping costs



Midwest engineers see things from the fabricator's viewpoint. Witness the Midwest reducing elbow. It saves a reducer and a weld. It cuts turbulence, and is much more workmanlike. Things like this are characteristic of Midwest welding fittings. And, as a matter of course, you get uniformity, accuracy, exceptional quality. Naturally you want something more than just *good* welding fittings. Your nearby Jones & Laughlin Supply store will serve you promptly, pleasantly, and with more than casual appreciation.

78 stores for your convenience!

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"... here's MY warehouse!"

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J&L STEEL

ARSENICAL ADMIRALTY 439

today's standard, designed for long-life in refinery service

Amount of critical alloying elements is checked in the laboratory with the help of this grating-type spectograph.

Every Anaconda Condenser Tube must withstand the hydrostatic pressure test required by A.S.T.M. Specification B 111.

CONTAINING approximately 70% copper, 28.96% zinc, 1% tin and 0.04% arsenic, Arsenical Admiralty 439 is highly resistant to dezincification, general corrosion, attack by fresh, brackish or salt waters, sweet or sour crudes under pressures, velocities and temperatures normally encountered in refinery condensers and heat exchangers.

Several years of extensive research preceded the commercial production of Arsenical Admiralty Tubes which was begun in 1934. The consistently satisfactory performance of Arsenical Admiralty Tubes in crude and re-run stills, cracking and polymerization plants for the past 15 years has fully proved the effectiveness of arsenic as an inhibitor of dezincification and has fully substantiated laboratory test results.

TECHNICAL SERVICE AVAILABLE

It is a function of the engineers of our Technical Department to assist tube users in the selection of the most economical alloy for any given set of operating conditions. Feel free to call on us. Publication B-2, giving detailed information on Tubes and Tube Sheet Alloys mailed on request. 48141

ANACONDA

Anaconda

HEAT EXCHANGER TUBES

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

The New JENKINS PLUG TYPE ARMOR SEAT VALVE

TAMES THE TOUGHEST VALVE SERVICES IN INDUSTRY

SETTING RECORDS FOR LONG LIFE AND LOW MAINTENANCE

For Severe Services like . . . PRESSURE REGULATION STEAM CONTROL • BY-PASS LINES • TEMPERATURE REGULATION APPARATUS THROTTLING • BLEEDS, DRIPS, DRAINS • SOOT BLOWERS • CONTINUOUS BOILER BLOWDOWNS • OPEN BLOWS ON BOILERS • ANY CLOSE REGULATION OF STEAM

In Many Industries like... DYE WORKS • BLEACHERIES BREWERIES • OIL REFINERIES • CREOSOTING PLANTS • PACKING HOUSES • MILK PLANTS • PLASTIC MOLDING PLANTS • HAT FACTORIES • GAS WORKS • TANNERIES • SUGAR REFINERS BOILER PLANTS • RUBBER MILLS

Do YOUR piping systems include valve-killing services that build up excessive maintenance and replacement costs? If so, the new Jenkins Fig. 976-A Plug Type Bronze Globe Valve will produce important savings for you.

Install it where "wire drawing", due to close control of steam, knocks out other valves quickly—where entrapped chips, rust, or scale score the seats and start leaks. See how it defeats the worst valve enemies . . . how it sets new records for endurance and economy.

HERE'S WHY

The stout "heart" of the Fig. 976-A is the stainless steel plug and seat ring, *hard enough* (500 Brinell) to smash steel pipe chips without scoring, yet *tough enough* to take a nine ton load without cracking. Other features are . . .

A **MORE THREADS, LESS WEAR**—Additional threads in bonnet and on spindle assure full thread engagement (open or closed), less load, less wear per thread.

B **NEW "TUFFARD" SPINDLE**—Aluminum bronze (tensile strength exceeds 65,000 lbs.)—tough to take stresses, yet hard for long wear. Bigger in diameter, with more strong threads.

C **NEW SLIP-ON, STAY-ON PLUG**—Simple design with T-slot for engaging spindle head is stronger, trouble-free, and permits free flow. Mirror-finished bevel assures perfect mating with seat ring.

D **NEW STURDY LUGS**—Flat-faced, V-shaped lugs on union bonnet ring and body ends, permit firm fit and grip of open end, pipe or monkey wrench—withstand repeated disassembly

500 BRINELL ARMOR SEAT Plug and Seat Ring of Jenkins JX500 special alloy stainless steel—heat treated to 500 Brinell hardness and extraordinary ductility—lapped together to a mirror finish. Unaffected by throttled steam, resists galling, erosion, corrosion.

Jenkins Bros., 80 White St., New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros. Ltd., Montreal

Get complete details in this new folder. *Mail coupon.*

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Please send Armor Seat Valve Folder—Form 193.

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Company.....

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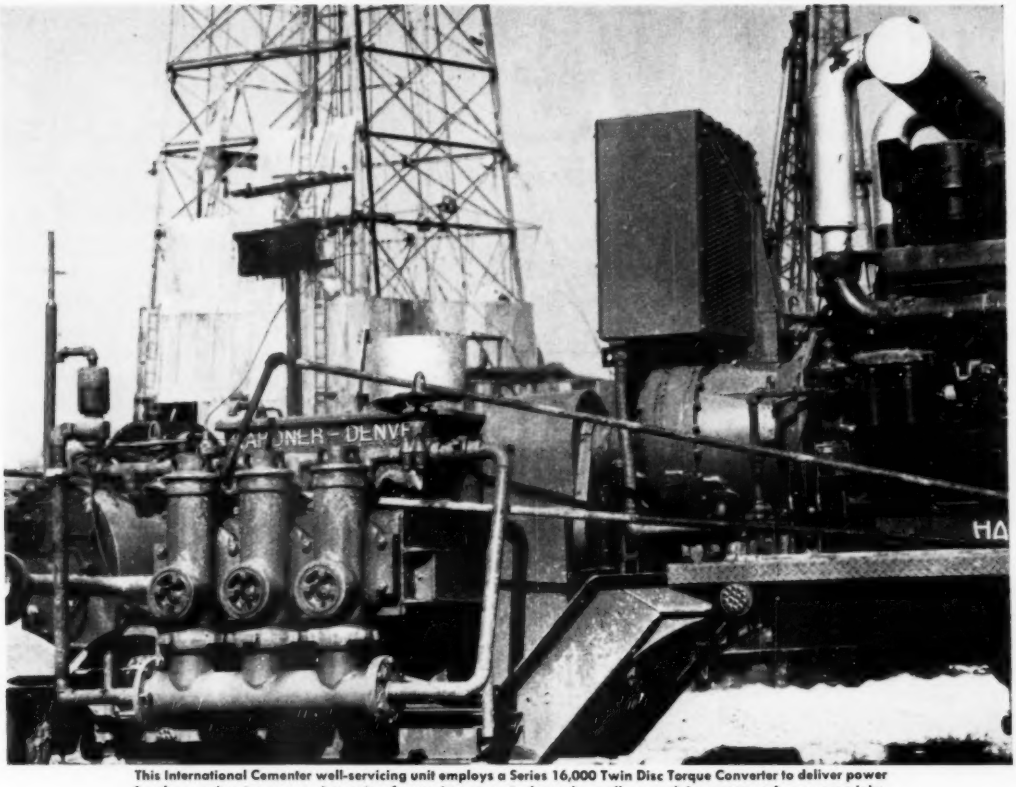
JENKINS VALVES

Types, Sizes, Pressures, Metals for Every Need



This International Cementer well-servicing unit employs a Series 16,000 Twin Disc Torque Converter to deliver power for the varying torque requirements of pumping cement, down the well or applying pressure for squeeze jobs.

To Make the Big Rigs BIGGER

When you want up to 1,000 horsepower handled with steam smoothness, specify the Series 16,000 Twin Disc Hydraulic Torque Converter.

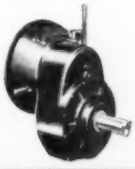
For this unit—the only torque converter in its class multiplying engine torque more than five times—is designed especially to expand the work capacity of big oil field equipment . . . designed especially to handle the 250 to 1,000 horsepower needed for bigger loads.

Every operator who has used Twin Disc Hydraulic Torque Converters can tell you the advantages—no gear-shift guesswork . . . uninterrupted acceleration from dead stop to capacity . . . shocks and vibrations eliminated . . . faster, cheaper operation all around.

Twin Disc Hydraulic Torque Converters are available in 44 models in three series, including the Series 16,000. Write the Hydraulic Division for Engineering Bulletin 135-C for more engineering details. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Div., Rockford, Illinois).

For Deep-Hole Drilling

For deep-hole drilling, down to 14,000 or 15,000 feet or deeper, specify a Series 16,000 Twin Disc Torque Converter, (Lysholm-Smith type), the *only* unit in the 250-1000 hp class that multiplies engine torque more than *five times*.



TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES
REG. U. S. PAT. OFF.

SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

GROVE

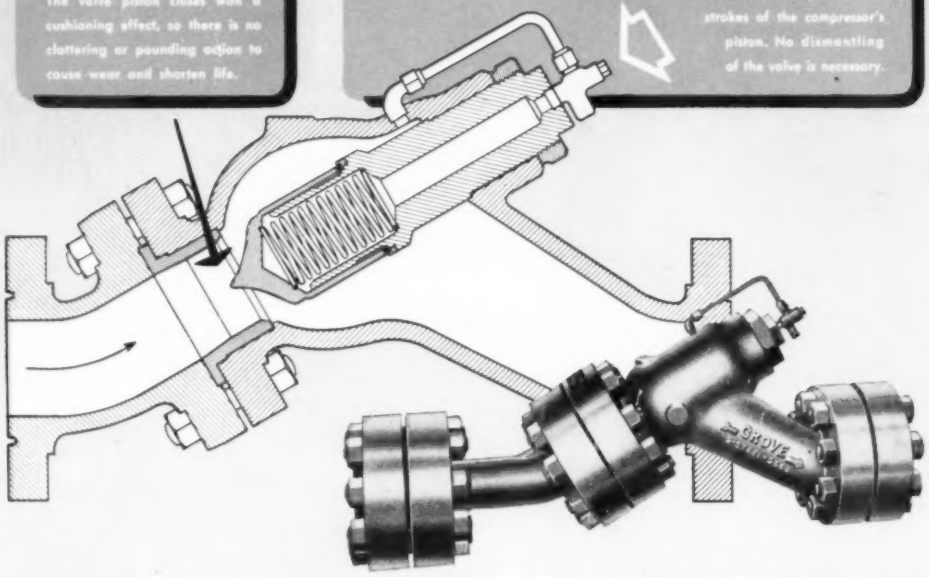
FULLSTREAM COMPRESSOR CHECK VALVE

SLOW CLOSING WITH NO POUNDING

The valve piston closes with a cushioning effect, so there is no clattering or pounding action to cause wear and shorten life.

ORIFICE ADJUSTABLE FROM OUTSIDE

Simply twist the Allen-head screw from the outside to obtain maximum operating efficiency. It's easy to adjust the orifice to counteract clattering of the valve in sequence with strokes of the compressor's piston. No dismantling of the valve is necessary.



IT'S BUILT FOR LONG LIFE IN SEVERE PULSATION SERVICE

The Grove Fullstream Compressor Check Valve has been proved superior by six years of actual field service. The Fullstream design, with only 30° change from line of flow, reduces turbulence and consequent pressure drop. The force required to overcome the weight of the piston and the compression of the spring is approximately one pound per square inch of area. The pressure drop in the 2-inch Fullstream Compressor Check Valve is so low that it is equal to less than 7 feet of pipe. The controlled flow through the adjustable orifice allows the valve to close slowly with a cushioning effect, overcoming the damaging shock of pulsation. Write or wire today for a Grove engineer to tell you the complete story of this important Compressor Check Valve.

The Outstanding GROVE FULLSTREAM Compressor Valve

Orifice easily adjustable from the outside.

Low pressure drop — equivalent to 7 feet of pipe in the 2" size.

The 2" size has less pressure drop than conventional 3" size.

Cushioning effect counteracts pounding, slamming, and clatttering.

Precision manufacture assures long life and maximum efficiency in operation.

Simplified field maintenance.

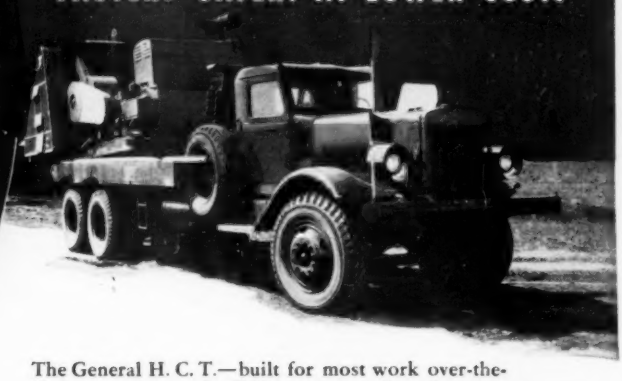
GROVE REGULATOR CO.

3608 NAVIGATION BLVD., HOUSTON, TEXAS
6529 HOLLIS ST., OAKLAND, CALIF.
1930 W. OLYMPIC BLVD., LOS ANGELES, CALIF.

GENERALS *give you*

MORE STRENGTH • LONGER WEAR
EXTRA SAFETY • TRACTOR TRACTION
BETTER FLOTATION TO GET EVERY JOB DONE

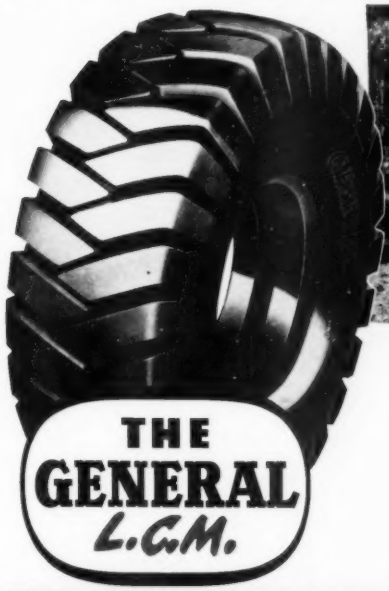
FASTER! SAFER! AT LOWER COST!

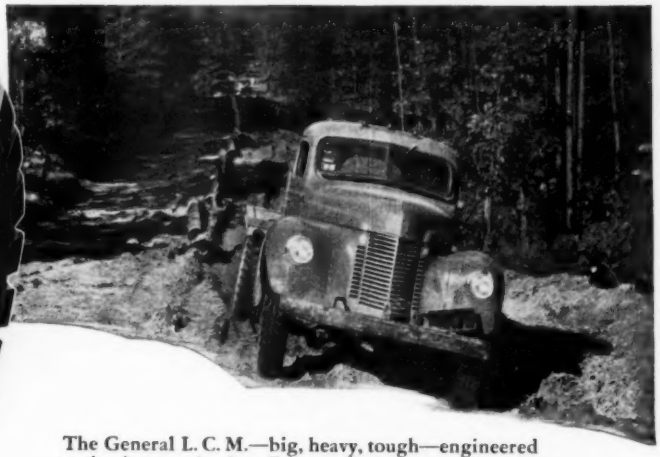


THE GENERAL H.C.T.

The General H. C. T.—built for most work over-the-highway, some work off. It's constructed to give more blowout protection at high speeds. The thicker, tougher tread keeps more rubber on the road longer. Through sand, gravel and mud the deep saw-tooth grooves develop extra traction. Shock absorber construction prevents breaking and ply separation.

GENERAL HAS THE RIGHT TIRE TO FIT THE JOB!





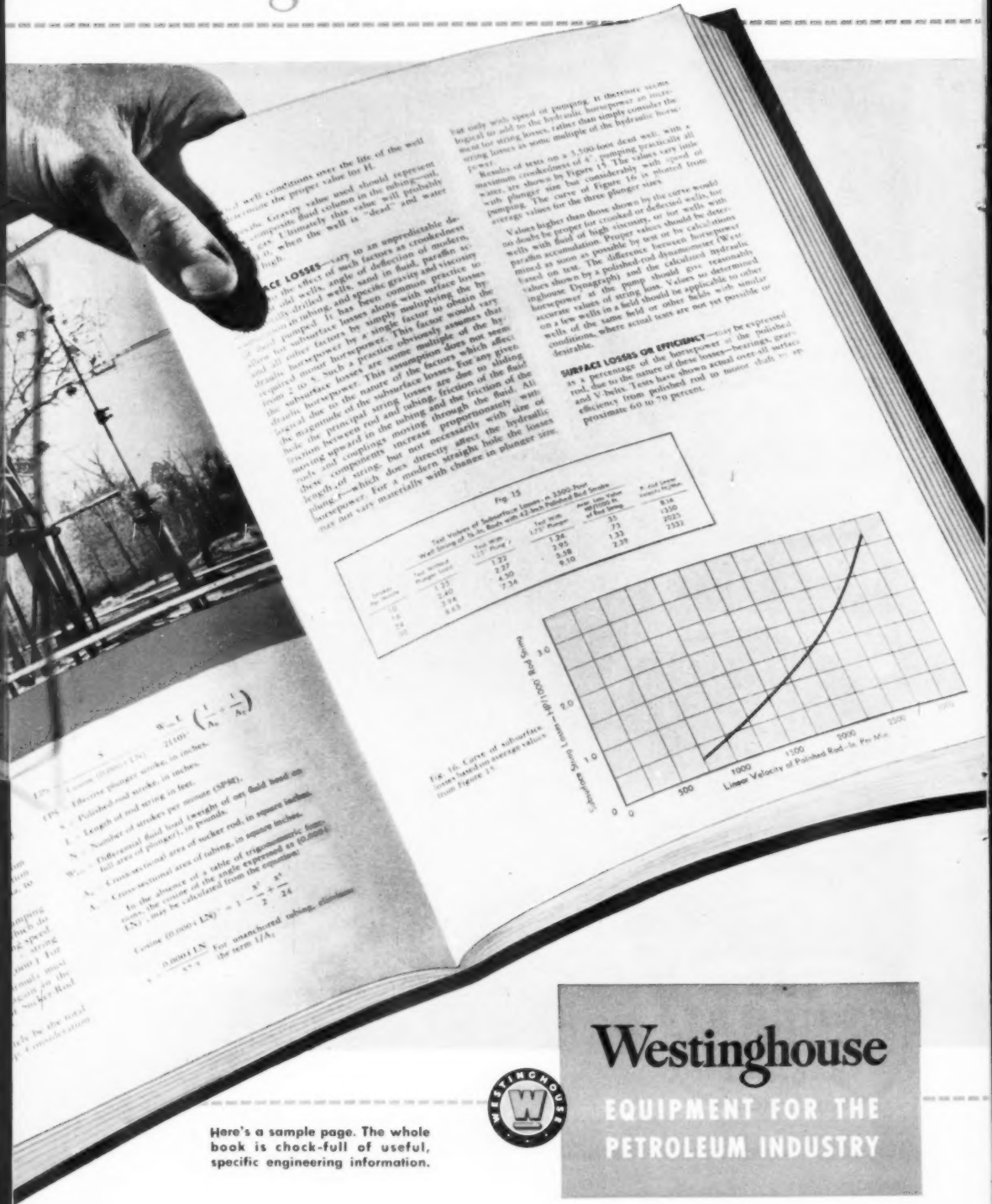
THE GENERAL L.G.M.

The General L. C. M.—big, heavy, tough—engineered to haul more loads off-the-road. Every massive lug of rubber develops extra traction forward or backward. More and better rayon cord plus exclusive shock absorber construction keeps the carcass firm and strong for safe recaps that mean more work-miles for your dollars.

SPECIFY GENERAL TIRES ON YOUR NEW EQUIPMENT

YOU CAN BE **SURE**.. IF IT'S

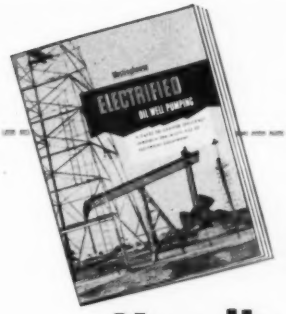
Westinghouse



Here's a sample page. The whole book is chock-full of useful, specific engineering information.

Westinghouse

EQUIPMENT FOR THE PETROLEUM INDUSTRY



Here's a New Helpful Handbook on Electrified Pumping

When you pump wells electrically, you make big savings. Are you getting your share? If not, this new 48-page book can help you make the long-range decisions that will affect the future economic course of your operations. If you're pumping with electricity now, you'll get factual engineering data that can boost your efficiency and sharpen up operating practice.

PROBLEM SOLVER

This book is heavy on facts. Authoritative information helps you answer such questions as: What size motors should I specify, which type? How about automatic time control? What's the best distribution system for my lease? How much transformer capacity do I need? What about lightning protection? —and a hundred others. You get information for detailed analyses now, have it assembled in a handy place for reference later on.

So fill out the coupon now and send it in. No obligation, of course.

HOW ELECTRIFIED PUMPING SAVES YOU MONEY

1. Sure starting and high efficiency regardless of the weather or age of equipment.
2. Easy, accurate measurement of power demand and consumption. Effective indication for proper counterbalancing.
3. Less manpower on the lease. Sure time-clock operation with no human attention.
4. Lower maintenance cost—less inspection, fewer wearing parts.
5. Low installation costs—only a minimum foundation required, no house needed for weatherproof motor and controls.
6. Trouble-free operation at low temperatures; no fuel storage problems.

Write for your copy now

Westinghouse Electric Corporation
P. O. Box 868
Pittsburgh 30, Pa.

Please send me, without charge, "Electrified Oil Well Pumping," B-4039.

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Company_____

Address_____

J-94800

Sid Richardson's *New Gasoline Plant* uses...

Philadelphia
WORM GEAR
Speed Reducers

We feel privileged that our Worm Gear Units are installed in the modern and efficient plant of the Sid Richardson Gasoline Co. in the Keystone Field of W. Texas. Reducers shown above are vertical type, with drive shaft extended upward . . . and are driving Atmospheric Coolers, direct-connected to gasoline engines.

For 58 years we have been making Gears and Gear Products . . . Following is partial list of Refineries in which some of our Products are installed:

Arabian-American Oil Co. . . . Ashland Oil & Refining Co. . . . Asiatic Petroleum Corp. . . . Atlantic Refining Co. . . . Champlain Refining Co. . . . Cities Service Refining Co. . . . Consolidated Refineries . . . Continental Oil Co. . . . Empire Refining Co. . . . General Petroleum Co. . . . Gulf Oil Corp. . . . Great Southern Oil Refining Co. . . . Humble Oil Co. . . . Imperial Oil Co., Ltd. . . . Magnolia Refining Co. . . . Mexican Petroleum Co. . . . Neches Butane Products Co. . . . Pan-American Refining Corp. . . . Phillips Petroleum Co. . . . Polymer Corp. . . . Premier Oil Refining Co. . . . Pure Oil Co. . . . Rock Island Refining Co. . . . Shell Oil Co. . . . Sinclair Refining Co. . . . Socony-Vacuum: (Beaumont, Brooklyn & Buffalo Plants) . . . Socony-Vacuum Oil Co. (Italy) . . . Socony-Vacuum (White Star Div.) . . . Southport Petroleum Co. . . . Standard Oil Co. of Calif. . . . Standard Oil Co. of Indiana . . . Standard Oil Co. of Louisiana . . . Standard Oil Co. of New Jersey . . . Standard Oil Co. of Ohio . . . Sugar Creek Refinery . . . Sun Oil Co. . . . Terminal Refining Corp. . . . The Texas Corp. . . . Tide Water Assoc. Oil Co. . . . Union Oil Co. of Calif. . . . Venezuelan Oil Concessions, Ltd., etc.

Send for 76-page illustrated catalog #26 and kindly use your Business Letterhead when requesting it.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON
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Industrial Gears and Speed Reducers
LimiTorque Valve Controls

How to meet...

YOUR SPECIFIC GAS PROBLEMS

Tell us-

INTAKE PRESSURES AVAILABLE...

DISCHARGE PRESSURES REQUIRED...

STATION CAPACITY:

Cu. ft. per 24 hours

TYPE OF APPLICATION:

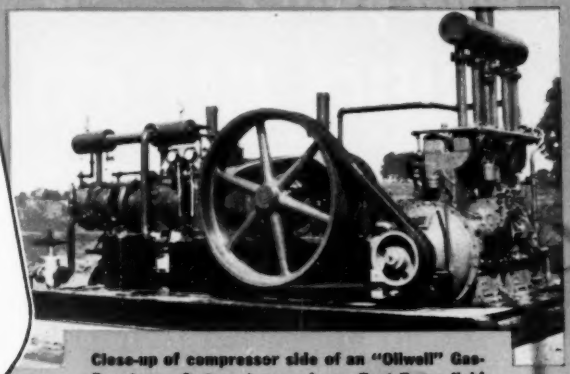
Gas Transmission.....

Underground Storage....

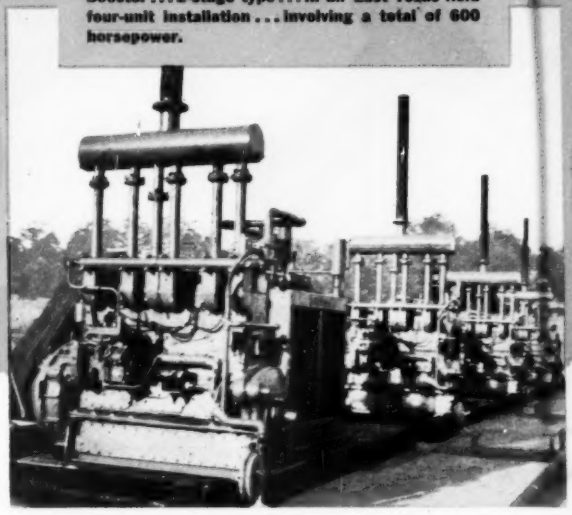
Other.....

and give

"Oilwell" the opportunity to analyze your gas pumping problems.



Close-up of compressor side of an "Oilwell" Gas-Booster... 2-stage type... in an East Texas field four-unit installation... involving a total of 600 horsepower.



"Oilwell" Gas-Booster Units are of single or multi-stage design, complete with gas engines specially equipped for gas-booster service. They include heavy-duty V-belt drives, fan-type coolers for both engine and compressor and necessary pressure gauges—all ready to tie-in and start.

All units are assembled on a heavy-duty structural steel skid-base, maximum width 8 feet, which permits convenient transportation of the unit by truck.

ENGINEERED FOR THE CUSTOMER

"Oilwell" Boosters are available in four standard ratings: 25, 50, 75 and 125 horsepower with either single or 2-stage compressors . . . 7, 9, 11, and 13 inch stroke units . . . direct connected or belted types.

CHECK WITH "OILWELL"

For complete information and any assistance you may desire in analyzing your compressor needs, contact your nearest "Oilwell" representative at any time. No obligation!

OIL WELL SUPPLY COMPANY

Branches Serving All Oil Fields

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USS

"OILWELL"

UNITED STATES STEEL

CAN YOU DO THIS *with your present* ORIFICE METERS?

INTERCHANGE HIGH SIDE CHAMBERS

Illustrating how [illegible] is converted [illegible] range to [illegible] simply [illegible] the high pressure [illegible]

It's an exclusive advantage in

ROCKWELL-EMCO *Orifice Meters*

The Rockwell-Emco gauge can be converted to any of six standard ranges—20", 50", 100", 200", 300" or 400", by simply unbolting one high pressure chamber and exchanging it for another. This feature permits the meter to be quickly and economically adapted to varying field conditions. It's a simple job that can be done on location.

Learn all about this conversion feature and the many other advantages of the Rockwell-Emco orifice meter. Ask the nearest District Office for a demonstration or write for bulletin 1050.

Make your Orifice Gauges

***the equivalent of* Straight-Readers**

THE ROCKWELL-EMCO INTEGRATOR

With a Rockwell Emco Integrator you can read from the dial counter the true values of recorded flow on various makes of simple flow meters. The integrator mechanically computes orifice meter charts—up to 300 average charts a day. Accuracy is assured since the operator traces the same recording of static and differential as was made by the gauge. Write for bulletin 1016.

Pittsburgh Equitable Meter Division
ROCKWELL MANUFACTURING COMPANY
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Polymerization (Phosphoric Acid)

High Octane
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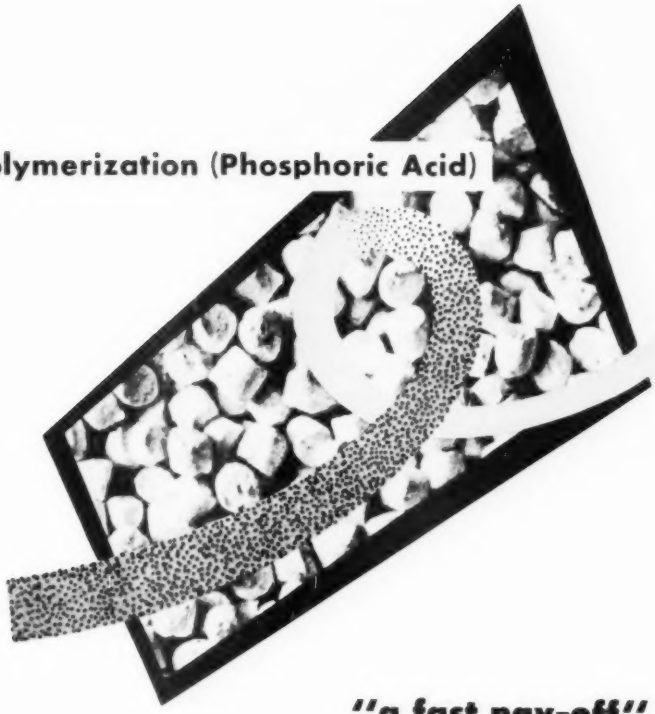

Gas Fuel

"a fast pay-off"

Catalytic Polymerization (Phosphoric Acid) is probably the most economically attractive process in Petroleum Refining. It is a simple low-cost operation, and if properly designed, will remain on stream for extended periods. A Foster Wheeler designed polymerization unit recently completed 3 years of continuous operation before it was shut down for general inspection.

Foster Wheeler will build within the next year 3 large polymerization units and the design and construction experience gained from these projects is available to other refiners,—anywhere in the world.

FOSTER WHEELER CORPORATION

165 BROADWAY, NEW YORK 6, NEW YORK

"Out of the sands of Iran"

. . . rises one of the world's largest Fluid Catalytic Cracking Units, designed and constructed by Foster Wheeler.

Four other "Fluid" units (one larger than the Abadan unit in the above illustration) are in various stages of Foster Wheeler design and construction.

design

engineering

fabrication

construction

FOSTER WHEELER CORPORATION

165 BROADWAY, NEW YORK 6, NEW YORK

The Complete Engineering and Construction Service
Anywhere in the World

FIGURE IN ALUMINUM
Alcoa Industrial Roofing and Siding used on Mitchell Power Station, West Penn Power Co., Pittsburgh, Pa.

EASY TO PUT UP IN TOUGH PLACES

Light—easy-to-handle Alcoa Industrial Building Sheet goes up fast—never needs paint

Construction is easier, faster when you use Alcoa Industrial Building Sheet. Heyl & Patterson who erected the aluminum sheet on conveyors, tipples and machine sheds for this West Penn Power Co. station said, "Alcoa Industrial Building Sheet is ideal for this type of job. The ease of handling, fastening and cutting, plus no painting requirements made this job go up even faster than we had figured."

Investigate Alcoa Industrial Roofing and Siding for all types of industrial construction. Cost is low, work goes up fast, painting costs are eliminated and aluminum lasts. It can't rust away, stands up under sulphur-laden industrial smoke and coal dust.

For engineering and application detail, call your nearby Alcoa Sales Office, listed in your classified telephone directory under "Aluminum" or mail the coupon.

FACTS FOR CONTRACTORS AND ENGINEERS

Alcoa Industrial Roofing and Siding may be erected over steel or wood purlins or girts. It may be fastened by nails, purlin nails, straps, clips, screws or weldable studs.

Length: 5 to 12 feet. Widths: Roofing, 35 inches. Siding, 33⅓ inches.

Thickness: .032 inches—equal to 22 U. S. Gauge.

Available for prompt shipment with all types of fasteners, flat and preformed flashing.

For complete details MAIL THIS COUPON, TODAY

Aluminum Company of America
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Please send me engineering and application data on Alcoa Industrial Building Sheet.

Name _____

Company _____

Address _____

City _____ State _____

ALCOA INDUSTRIAL BUILDING SHEET

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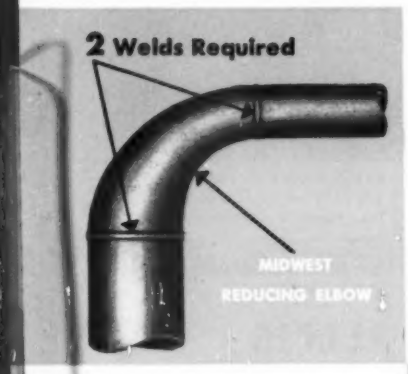
INGOT • SHEET & PLATE • SHAPES, ROLLED & EXTRUDED • WIRE • ROD • BAR • TUBING • PIPE • SAND, DIE & PERMANENT MOLD CASTINGS • FORGINGS • IMPACT EXTRUSIONS
ELECTRICAL CONDUCTORS • SCREW MACHINE PRODUCTS • FABRICATED PRODUCTS • FASTENERS • FOIL • ALUMINUM PIGMENTS • MAGNESIUM PRODUCTS

SAVE MONEY and get BETTER PIPING by using the

MIDWEST

REDUCING ELBOW



Instead of a Standard Elbow and a Reducer

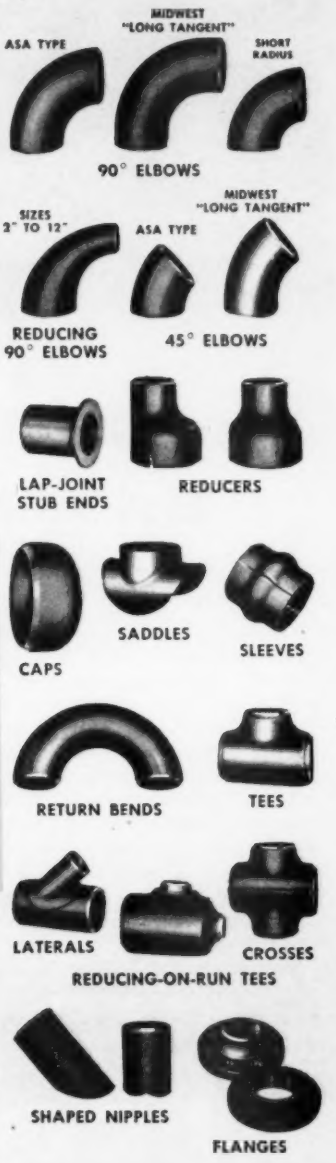
The Midwest Reducing Elbow saves more than a third of the welding when used instead of a standard elbow and reducer. In addition to a substantial saving in time and money, it provides much neater appearance and insulation is easier. The gradual reduction, smooth curve and absence of abrupt neck reduce the pressure drop and turbulence. Center-to-end dimensions are the same as for ASA standard elbows.

All the advantages of Midwest Standard Elbows are to be found in Midwest Reducing Elbows . . . unusual dimensional accuracy and uniformity, stress relieving, beneficial effect of working metal in compression, etc.

The Midwest Reducing Elbow is only one of many fittings developed by Midwest to reduce the cost and improve the quality of welded piping. You will find it advantageous to get in touch with the Midwest Distributor near you whenever you need welding fittings.

MIDWEST WELDING FITTINGS

Improve Piping Designs and Reduce Costs

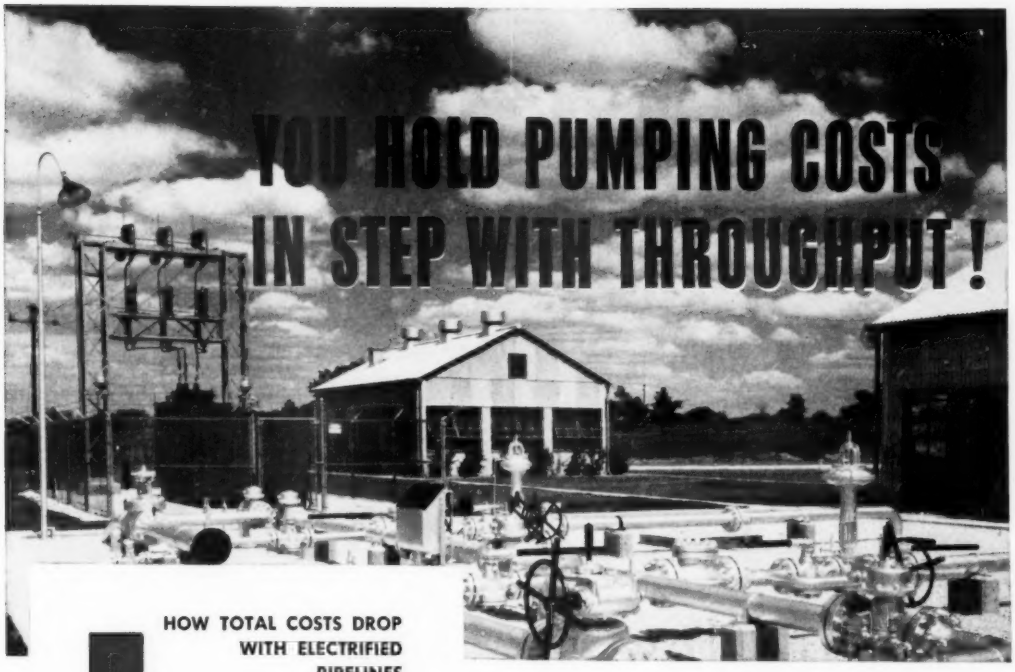


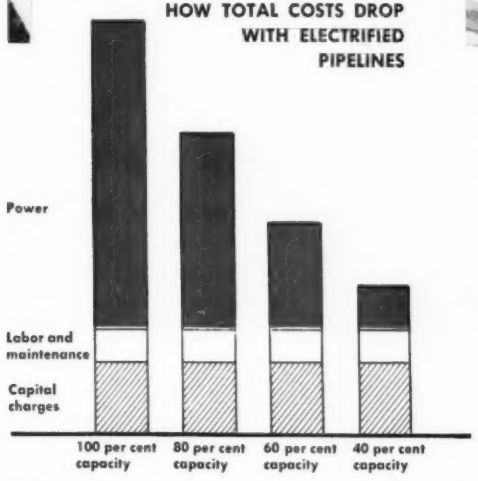
MIDWEST PIPING & SUPPLY COMPANY, Inc.

Main Offices: 1450 South Second Street, St. Louis (4), Mo.

***Sales Offices:* New York (7), 30 Church St.**

Chicago (3), 79 West Monroe St. • Los Angeles (33), 520 Anderson St. • Houston (2), 229 Shell Bldg. • Tulsa (3), 533 Mayo Bldg. • South Boston (27), 426 First St. • Distributors in Principal Cities.





With electric power, maintenance and labor costs are low and total operating costs drop sharply at reduced capacities, as this chart shows. Actual capacity factor of the nation's pipelines has always averaged less than 100 per cent annually, has even gone as low as 37.3 per cent.

DON'T MISS IT! Ask your G-E representative about a showing of "Lease on the Future," G-E's More Power to America program on how the oil industry is applying electric power with profit.

With electrical equipment, capital charges, labor and maintenance are low. Total operating costs with electrical equipment drop sharply as throughput goes down . . . and less power is used. This makes total operating costs correspond closely to throughput instead of being pegged at a high level. And here are other savings:

Reduces initial investment cost Lowest-cost equipment for oil pipeline pumping is the electric-motor-driven centrifugal pump.

Releases manpower for other duties Electric equipment needs little attention, lends itself readily to automatic control that further saves manhours.

Simplifies operation Automatic control minimizes the chances of human error, permits centralizing controls for greater efficiency.

Lowers maintenance costs Electric motors cost less to maintain than any other type of drive.

WHEN YOU "GO ELECTRIC," GO GENERAL ELECTRIC!

Here's what you get: (1) Everything electric you need from an extensive range of quality products. (2) Helpful services of skilled application engineers familiar with pipeline industry needs. (3) A complete, integrated electrical system when G.E. co-ordinates the selection, manufacture and shipment of all the equipment required. (4) Quick servicing of any G-E apparatus from the nearest of 30 service shops.

To electrify efficiently, call your nearest G-E office first. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

Everything you need to cut oil pipeline costs —ELECTRICALLY!

GENERAL ELECTRIC

You Can Get

EXTREMELY ACCURATE READING...

FOR 48* DIFFERENT TEMPERATURES

When You Use

THE NEW *ElectroniK* PRECISION INDICATOR WITH EXTENDED RANGE

Just push a button and read, at a glance, the temperature of any location tied-in with this quick-as-a-flash *ElectroniK* Precision Indicator. Each of the 48 buttons gives you instantaneous contact with the temperature condition at the location of its thermocouple.

The "extended range" adds new versatility . . . makes the instrument an even more valuable tool for precision process applications. For example, a wide range scale can be used for readings starting with ambient temperatures and continuing up to "on stream" temperatures. Once on stream, a narrow range scale is used to obtain extremely accurate readings, taking full advantage of the inherent accuracy (±1/5%) of the instrument. In addition to this pin-point readability, you get one instrument that will do the work of two . . . saving valuable panel board space.

Call in your local Honeywell engineer for detailed information . . . he is as near as your phone. Ask him, too, about the "double range" instrument which employs two types of thermocouples to provide measurement of temperatures over a very wide range.

COMMERCIAL • RESIDENTIAL • INDUSTRIAL

WORLD'S LARGEST ORGANIZATION FOR ADVANCED INSTRUMENTATION AND CONTROL

MINNEAPOLIS-HONEYWELL REGULATOR CO. • BROWN INSTRUMENTS DIVISION

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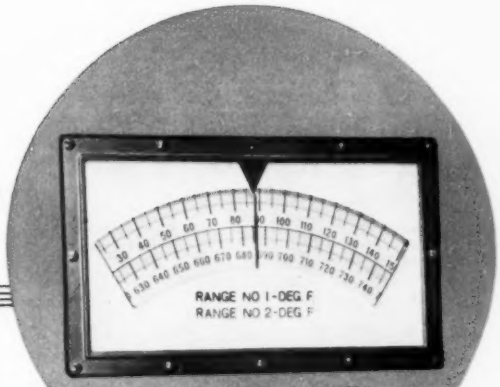
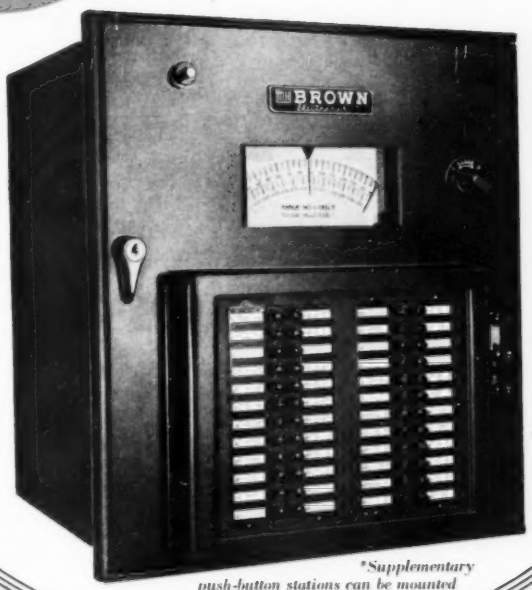
Offices in 77 principal cities of the United States, Canada and throughout the world

...AT ONE CENTRAL LOCATION...



Calibrated length of scale is 28½".



*Supplementary push-button stations can be mounted adjacent to instrument for additional temperature measurements.

MINNEAPOLIS Honeywell — Advanced Instrumentation FOR THE PETROLEUM INDUSTRY — BROWN INSTRUMENTS

Lufkin for the THRIFTY ...in 1950

Lufkin commercial gear reducers and speed increasers, in all sizes and for all conditions, are available, usually from stock. Send today for our special gear catalog!

Records maintained by long-time users of Lufkin Pumping Units reveal the utmost in economy in operating and maintenance costs . . . the all-important factors in this day. Truly it's *"Lufkin for the Thrifty in 1950!"* Our engineers will gladly give you the Lufkin story. *Call them today!*

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Lufkin Equipment in CANADA is handled by
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Stops Corrosion . . . a combination of coatings and Fiberglas Coromat resists moisture, acids and soil stress. The high porosity of Fiberglas Coromat permits uniform and complete penetration, eliminates a common cause of holidays.

Low Cost . . . even though offering greater protective qualities, Coromat costs less than 1½¢ per square foot.

1. Provides better penetration.
2. Fibers of glass cannot rot, decay or absorb moisture.
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6. Retains full strength under hot application.
7. Fiberglas Coromat resists all soil acids encountered.
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FREE booklet *"Corrosion Protection For Underground Pipe" and a free sample of this stronger Coromat are available to you. Write today to Owens-Corning Fiberglas Corporation, Dept. 54-D4, Toledo 1, Ohio. Branches in principal cities.*

FIBERGLAS IS IN YOUR LIFE...FOR GOOD!

**Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers Coromat is the trade-mark of Owens-Corning Fiberglas Corporation.*

How this independent businessman got his start

We'd like you to meet a man who has hung out his own shingle.

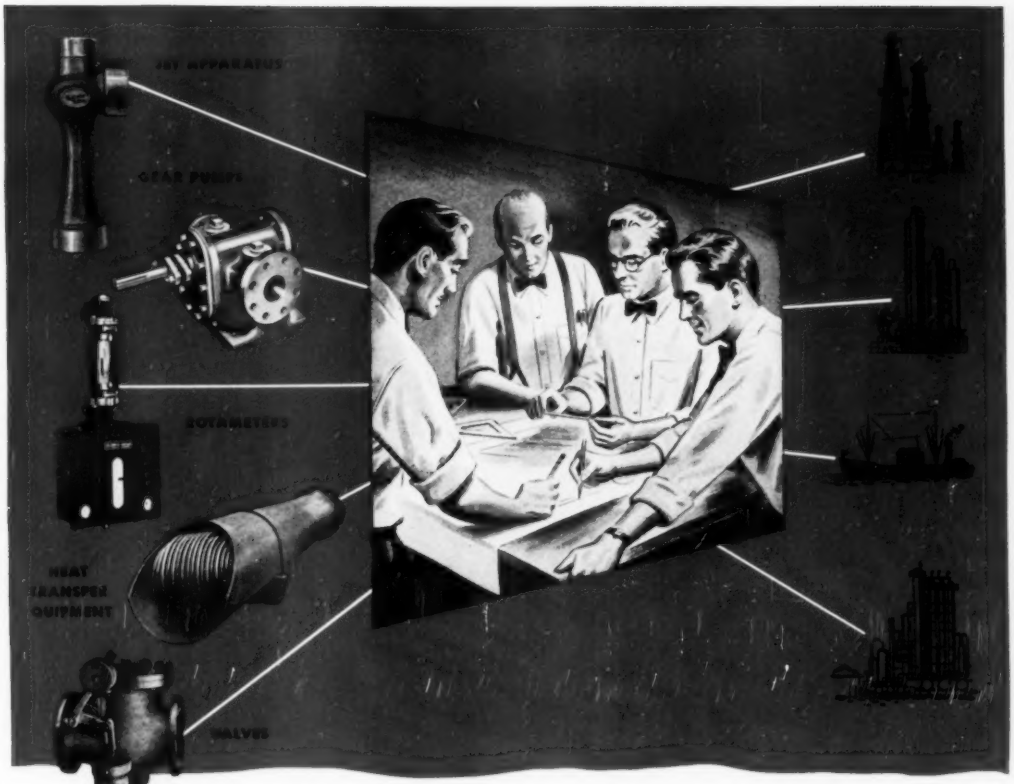
This Standard of California Distributor, like those all over the West, works as an independent businessman . . . and here's how we helped him get his start.

We first turned over a going business to him with a good list of customers. We helped him learn the best methods of serving his neighbors well . . . supplied the finest products, expert engineering help in meeting tough lubricating problems, the benefits of all our laboratory research and every other practical assistance possible.

He, in turn, supplied the ingenuity, skill and ambition of a man who is working for himself.

This teamwork between small and large business has benefitted everyone. Your Standard Distributor has his roots and interests right in his own town; the money he makes stays in your community. And because he knows local conditions through long experience and is building *his own business,* he does a better job for us by doing an outstandingly good job of serving you.

STANDARD OIL COMPANY
OF CALIFORNIA
plans ahead to serve you better



SK ENGINEERING SERVICE SOLVES YOUR PETROLEUM PROBLEMS

The many types of equipment bearing the SK mark are designed and built to render years of outstanding performance. SK Engineers have long been aware of the necessity for engineering each specific application to assure the user of full performance value, economy and satisfaction. That's why SK Engineering Service is maintained for all those faced with problems involving the use of SK products in the producing, gas processing, refining or transporting phases of the industry.

An amazing amount of problem-solving knowledge has been accumulated in our seventy-odd years of engineering and manufacturing equipment for the petroleum industry. Since that knowledge is available for your use, why not use it?

If you're interested in any particular type of product, request a catalog. We will gladly supply it. If you have a problem requiring engineering assistance, our engineers are as close as your phone.

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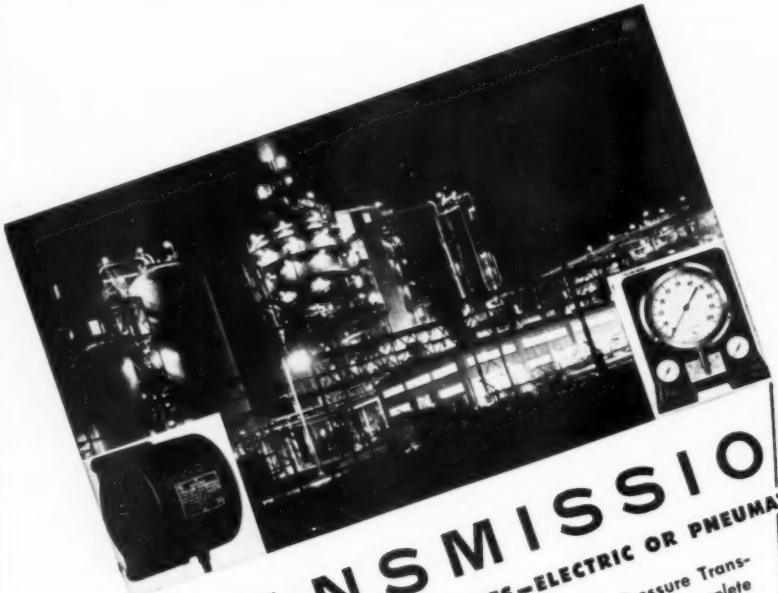

TRANSMISSION

OF PRESSURE MEASUREMENTS—ELECTRIC OR PNEUMATIC

Ashcroft Pneumatic or Microsen Electric Pressure Transmission Systems bring to one operator a quick and complete picture of all the important process variables employed.

Safe, accurate, and economical, they are designed for pressures up to 50,000 p.s.i. *with no distance limitations.* Pressure elements incorporate all the design advantages of the famous Ashcroft Duragauge. There is an extensive selection of Bourdon tube designs, materials and protective devices for all conditions of service.

The Microsen Electric Transmitter employs the unique Microsen Balance principle. It delivers a straight line D.C. output signal free from drift and alternating current interference.

Both systems are easy to install, simple to maintain. Bulletins describing each system available upon request.

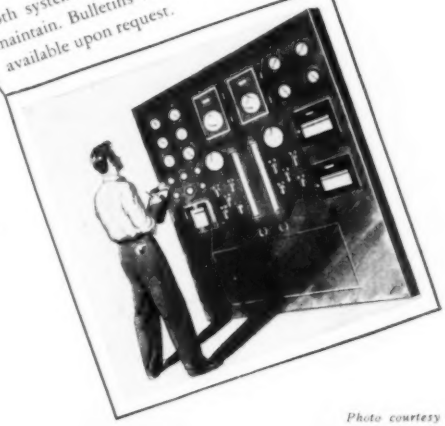

Photo courtesy Shell Oil

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STAYNEW MODEL DS INTAKE FILTER

Both silencing and filtering in a single compact unit! All the outstanding advantages of the original Staynew Dry-Type Radial Fin Construction: low resistance to air flow; increased efficiency with use; suitability for use on carbon ring compressors; no oil, viscous coating or charging tanks; no moving parts; inserts easily and inexpensively cleaned or replaced.

Silencing is efficiently handled without excess back pressure thru a series of cylindrical rectifying chambers of scientific diameter to length ratio.

Thousands of these well-designed, well-built Staynew Filters are already in use, saving wear on compressor and internal combustion engines, reducing intake clamor.

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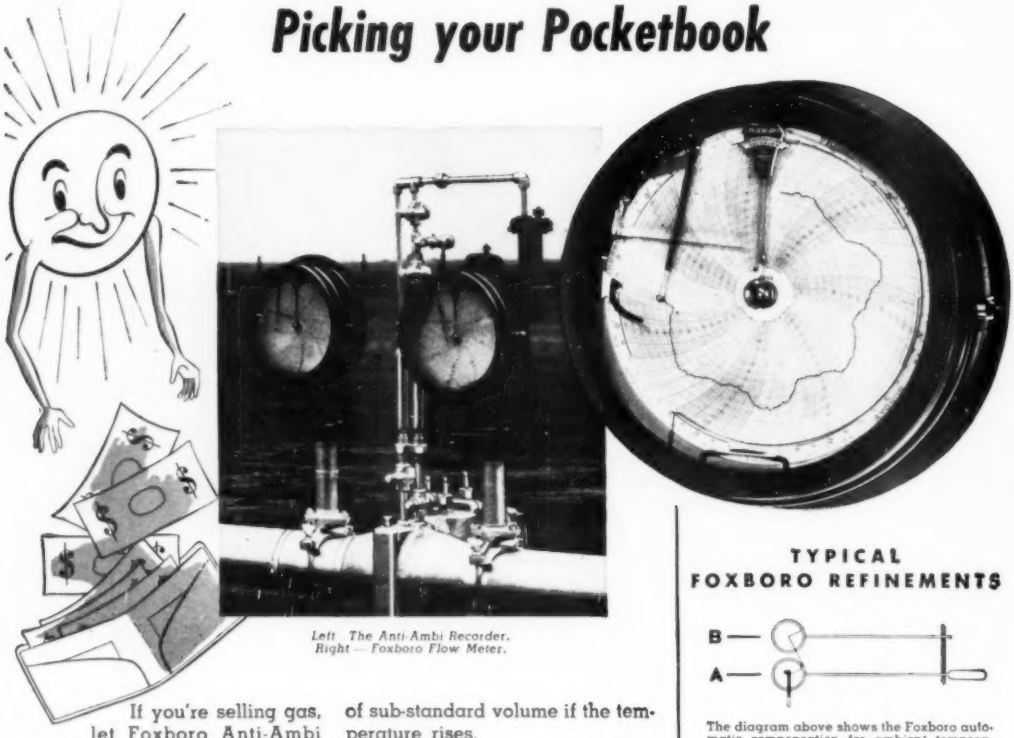
HOW TO KEEP THE WEATHER FROM

Picking your Pocketbook



Left — The Anti-Ambi Recorder.
Right — Foxboro Flow Meter.

If you're selling gas, let Foxboro Anti-Ambi Temperature Recorders protect you against expansion or contraction losses due to the ups and downs of the weather. They'll give you continuous, accurate records of gas temperature . . . permitting full correction for every variation and precise accounting of deliveries.

Temperature changes raise havoc with gas metering. With orifice meters, a variation of only 10°F., unless corrected for, causes an error of 1% in metered volume. (With displacement meters, this error is twice as great.) When you're selling gas, this means an actual out-of-pocket cash loss if the temperature drops, or the delivery of sub-standard volume if the temperature rises.

Like other Foxboro Instruments for the oil and gas industry, the Anti-Ambi Recorder is extremely rugged as well as accurate. Designed for service in the "wide-open spaces", it has a weather-tight case. It's fully compensated for external temperature changes . . . built to operate under the roughest conditions, with a minimum amount of attention. These are reasons why more Foxboro Anti-Ambi Recorders are in service today than all other makes combined.

Get all the facts about these better-engineered instruments. Write for Bulletin 376. **The Foxboro Company, 60 Neponset Ave., Foxboro, Mass., U. S. A.**

TYPICAL FOXBORO REFINEMENTS

The diagram above shows the Foxboro automatic compensation for ambient temperatures. Both the primary measuring system (A) and compensating system (B) are contained in the same instrument case (and length of protective tubing). The compensating system acts as an automatic zero setting for the primary system. Instrument and compensation are calibrated at the same time.

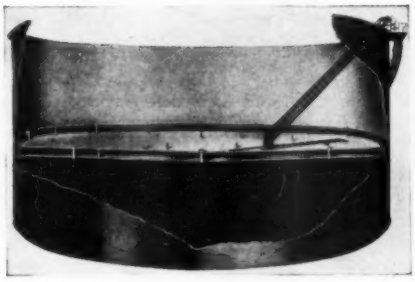
This drawing shows the small diameter, quick-response bulb used with the Foxboro Anti-Ambi Thermometer. The bulb is made with a stainless steel neck to reduce conduction effects.

The bulb is protected by the special socket shown above. It has aluminum fins for rapid heat transfer to the bulb and a stainless steel extension to minimize heat conduction to the socket head.

FOXBORO REG. U. S. PAT. OFF.

Anti-Ambi THERMOMETERS

GRAVER FLOATING ROOF TANKS



Cut-away view showing details of Graver Double Deck construction.

• The Full Double Deck construction of the Graver Floating Roof effectively provides "profit protection" in both the production and finished product stages. It is especially recommended for its resistance to the corrosive action of "sour crude"...or for the storage of finished petroleum products in areas too isolated for practical manifolding...and where excessive differences in filling or withdrawal exist, as in a deep water terminal.

Fabricating the finest in *each* type of tank, Graver is in a position to determine which will best fit your particular situation and deliver maximum protection against vapor losses and corrosion. Take a look at the record of Graver Conservation Equipment...talk it over with Graver engineers. Prompt information and recommendations will answer your call, letter or wire.

FABRICATED PLATE DIVISION

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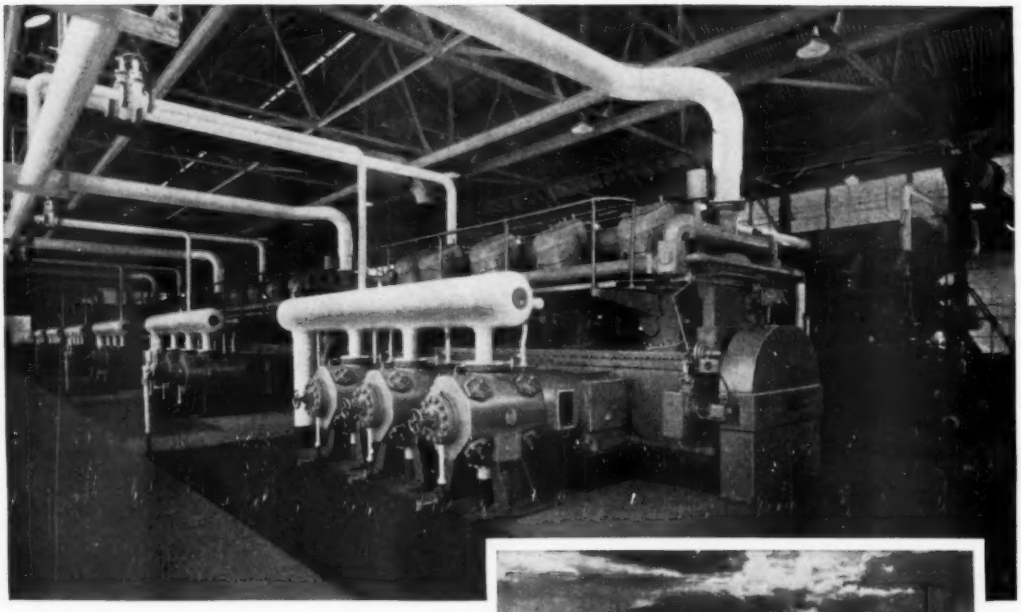
20,000 HORSEPOWER

INGERSOLL-RAND KVG GAS-ENGINE COMPRESSORS



for El Paso Natural Gas Company's Guadalupe Station

It takes a lot of horsepower to move 330 million cubic feet of gas from Texas to California. Here in the Guadalupe Station alone (one of 6 compressor stations on the El Paso Natural Gas Line), there is a total of twenty, 1000-hp compressors—all Ingersoll-Rand KVG gas-engine-driven units. Fourteen of them, shown above, are located in the main compressor plant, and six more (on the loop) are in an adjacent building. And 5 additional, similar units will be installed here in the near future.

In applications like this, dependability is a most important requirement . . . as are economy of operation and ease of maintenance. That's why Ingersoll-Rand KVG gas-engine-driven compressors are first choice with so many gas-line operators and maintenance men. They know, from experience, that these compact, rugged and powerful units can always be depended on to stay on the job, 24 hours a day, year after year, with minimum attention. And their 4-cycle, V-angle design permits maximum operating efficiency.

Whatever your compressor requirements, your nearest I-R representative is qualified to give you expert guidance . . . to help you select the equipment best suited to your needs.

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LUNKENHEIMER VALVES

...proved in petroleum service!

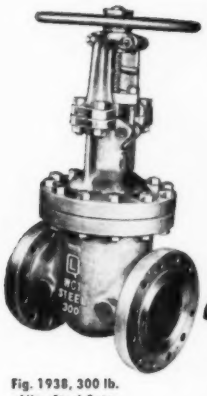

Fig. 1938, 300 lb. Alloy Steel Gate

Fig. 1640, King Clip Gate

Fig. 1430, Iron Body Gate

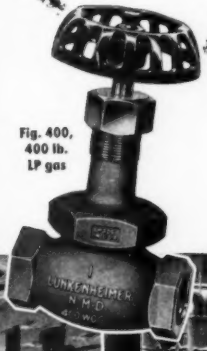

Fig. 400, 400 lb. LP gas

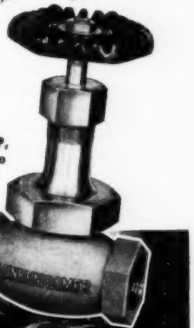

Fig. 16P, Renewo

FROM the oil fields, right through practically every process, oil men know they can depend upon all Lunkenheimer Valves for trouble-free, low-cost service. Engineers and maintenance men rely on valves, lubricators, air devices and other products bearing the name Lunkenheimer . . . recognized the world over as positive assurance of efficient performance, long service life and low maintenance cost.

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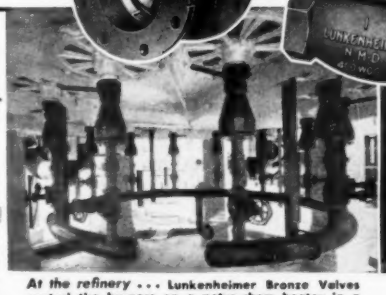
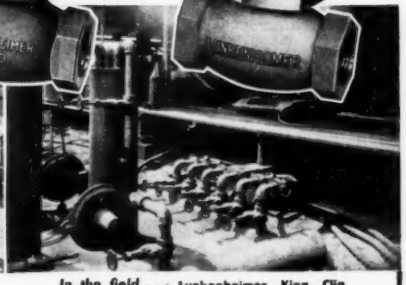
LET THE LUNKENHEIMER DISTRIBUTOR "TAKE OVER" YOUR INVENTORY PROBLEMS!

There are Lunkenheimer Distributors in every petroleum producing and refining center. Their stocks help you reduce inventory overhead and obsolescence.



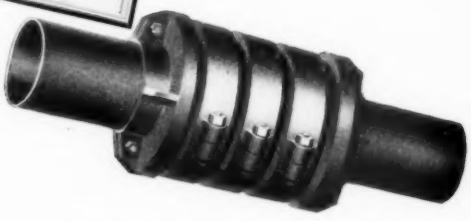
At the refinery . . . Lunkenheimer Bronze Valves control the burners on a petro-chem heater in a Texas gasoline plant.



In the field . . . Lunkenheimer King Clip Valves on a fuel manifold to drilling engine on a typical Oklahoma drilling rig.

CMH Free-Flexing Expansion Joint

CMH takes the MYSTERY out of expansion joint selection



CMH Controlled-Flexing Expansion Joint

The cloak of mystery is gone—for most services, the new 24 page CMH "Design Guide" simplifies selection and application of expansion joints to a matter of easy-to-use tables. Entering these tables with basic data on your installation you can find the expansion joints necessary to meet your requirements.*

The CMH "Design Guide" also provides a helpful source of general information on expansion control and presents technical data and specifications for CMH Expansion Joints.

Write for a copy of the CMH "Design Guide" and on your next job specify CMH Expansion Joints and eliminate the headaches that are so often a part of selection of this equipment.

***CMH ENGINEERED APPLICATION SERVICE** is available for unusual installations. Competent piping specialists will analyze your problems and make recommendations.*

CMH FREE-FLEXING EXPANSION JOINTS for pressures to 30 psi.; temperatures to 1400°F. Sizes to 24" I.D. Flanges or welding ends. Stainless Steel or Copper.

CMH CONTROLLED-FLEXING EXPANSION JOINTS with precision mated control rings for pressures to 300 psi.; temperatures to 1400°F. Sizes to 24" I.D. Flanges or welding ends. Stainless Steel or Copper.

FOR HIGHER PRESSURES special CMH Expansion Joints can be furnished. Recommendations will be made on receipt of installation details.

CMH—ONE dependable source
for every flexible metal hose requirement

• CMH manufactures all standard types of flexible metal hose, both convoluted and corrugated, in a variety of metals; expansion joints for piping systems; stainless steel and brass bellows; various conduits and special assemblies of these components.

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Leaders in the Science of Flexonics
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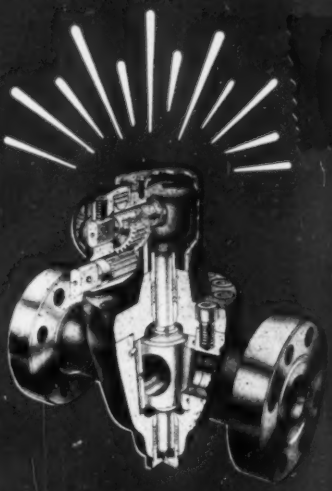
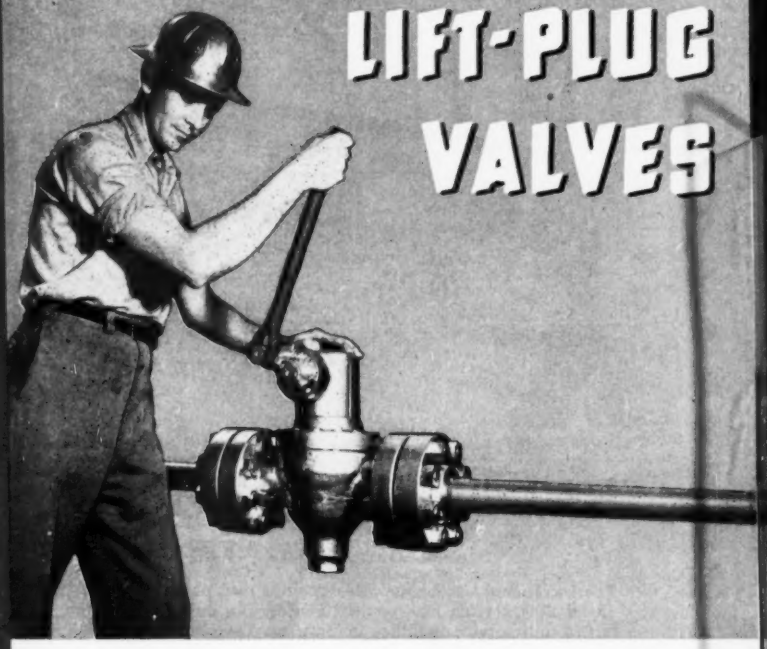
FLEXON . . . . . identifies CMH products which have served industry for more than 47 years

ELIMINATE VALVE LUBRICATION EXPENSE AND BOTHER



Cameron NON-LUBRICATED LIFT-PLUG VALVES



THE BEST FEATURES OF PLUG AND GATE VALVES COMBINED WITH NEW CAMERON INNOVATIONS

- NON-LUBRICATED — no grease of any kind required to effect a seal; also reduces chance for human error and need for maintenance.
- PRESSURE SEALING—when plug is seated, line pressure automatically forces seat into tighter engagement with plug.
- UNIQUE LIFT-PLUG ACTUATOR—a novel mechanical design which lifts, turns and reseats plug in continuous turn of a lever.
- RENEWABLE SEAT AND PLUG—easily replaced; permits any desired trim.
- FIELD REPAIR — can be completely overhauled without removal from line; no special tools or skill required.
- EASY OPERATION — requires less operating effort than other valve designs.
- FORGED STEEL—all parts, including body, are press or drop forged from specification materials.

Body distortion will cause most conventional valves to leak because the sealing surfaces tend to separate under the action of pressure forces and line strains. To bridge this separation of sealing surfaces, a viscous lubricant is usually injected into the valve, resulting in high material and labor costs in order to maintain proper functioning.

The Cameron "LP" Valve functions properly and seals without lubrication of the sealing surfaces due to the novel design which incorporates a separate seat and which is not attached to the body. Obviously, body distortions cannot affect the sealing efficiency because they cannot be transmitted to the seat. As a matter of fact, line pressure acts on the seat itself to improve the sealing contact between the seat and plug.

Completely descriptive literature and dimensional data will gladly be sent to interested operators upon request.

Cameron IRON WORKS, INC.

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March Fifteenth, Nineteen Hundred Fifty
Adequate stocks of Hercules Power Units, Engines and Parts will be maintained as well as complete facilities for the repair of engines
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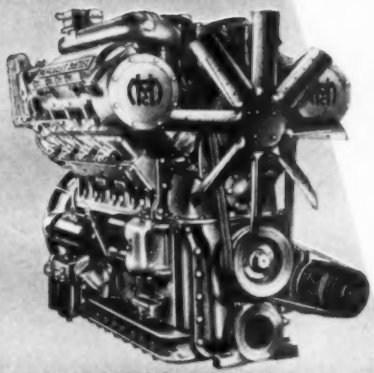
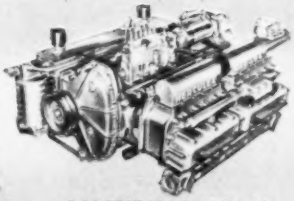


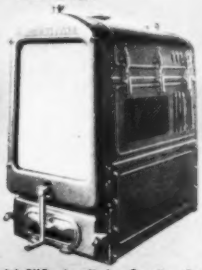
Model DHX-V8—8 cylinder Diesel Engine
Vee Type

HERCULES expands service in oil fields!

The increasing use of Hercules engines and power units in oil field service has resulted in Hercules enlarging its sales and service facilities in Houston, Texas. To do this new quarters were required. The new location at 6818 Navigation Blvd. now provides ample space to carry increased stocks of Hercules engines and power units for immediate delivery . . . a completely modernized department where an adequate stock of service parts is maintained at all times and a large, modern, fully equipped machine shop where engines and power units can be repaired, overhauled or rebuilt economically. These facilities are for the benefit of present and future Hercules users. We hope you will come in and look them over . . . and make good use of them when in need of expert Hercules service.



Model DFXHF—6 cylinder Diesel Engine
Pancake Type



Model RXC—6 cylinder Gasoline Power Unit
Closed Type

IN ADDITION . . . Similarly expanded facilities are provided in Hercules branches at LOS ANGELES, CAL., SALEM, ILL., KILGORE AND ODESSA, TEXAS

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The following Hercules oil field distributors are similarly equipped

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Oilfield Motor Service
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Superior Iron Works & Supply Co
Shreveport, Louisiana

Hercules-Lupfer Engine Sales Co.
Tulsa, Oklahoma

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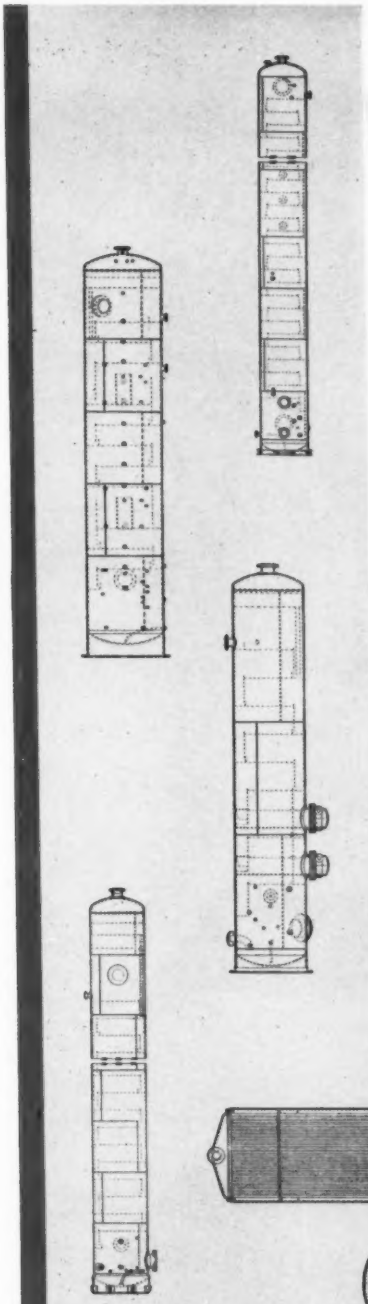
29 SERIES • 63 MODELS • GASOLINE AND DIESEL • 3 TO 500 H. P.



BUILT *Right*

Close fractionation of hydrocarbons and high liquid output are operating features of TULSA TYPE Fractionating Columns.

TULSA TYPE is designed and fabricated to meet your specified operating conditions.

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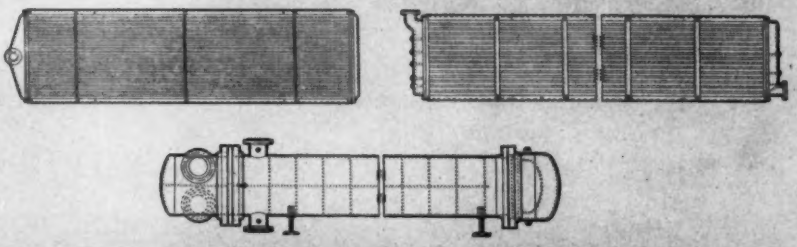

PLATE FABRICATING_____STRUCTURAL FABRICATING

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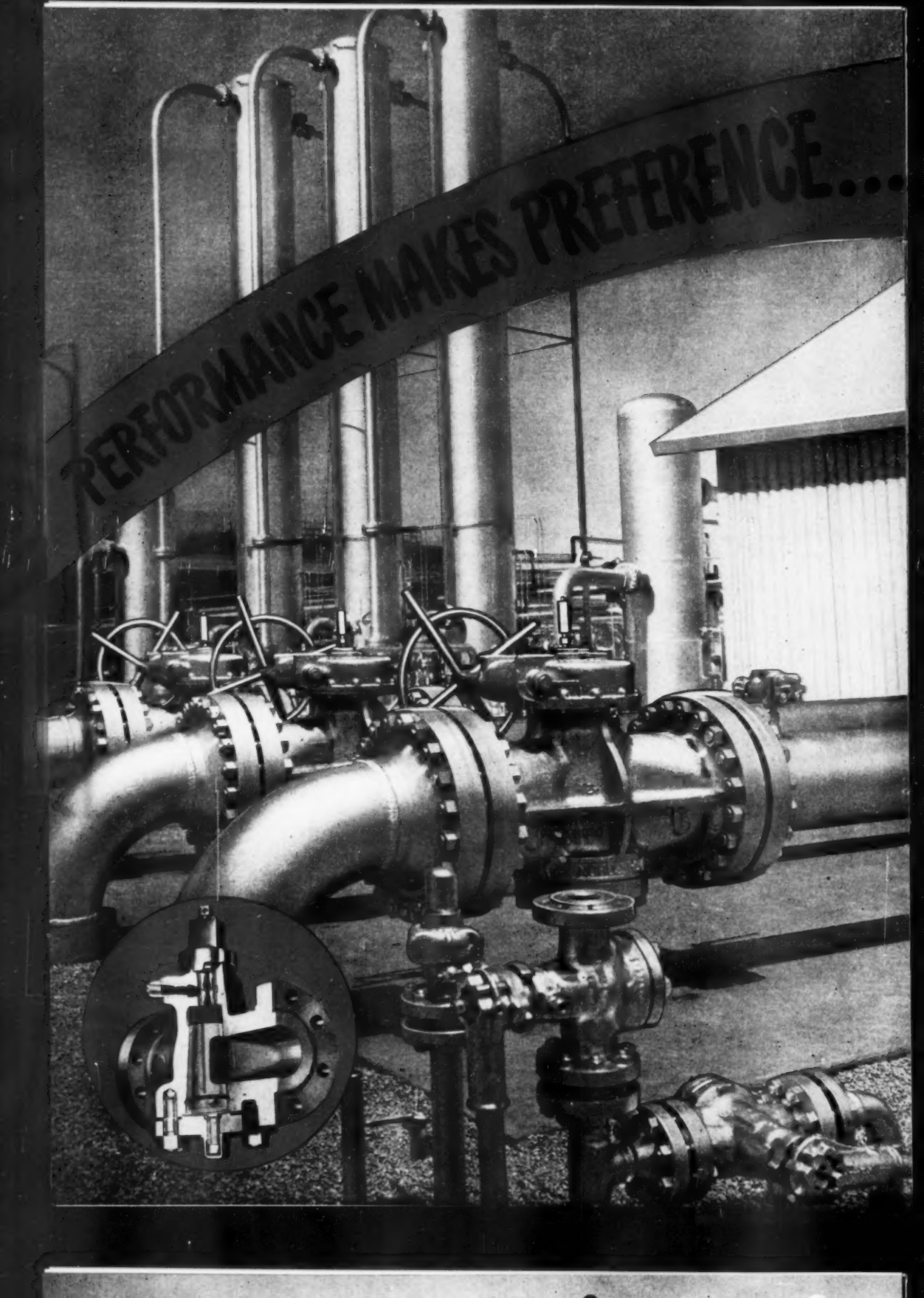
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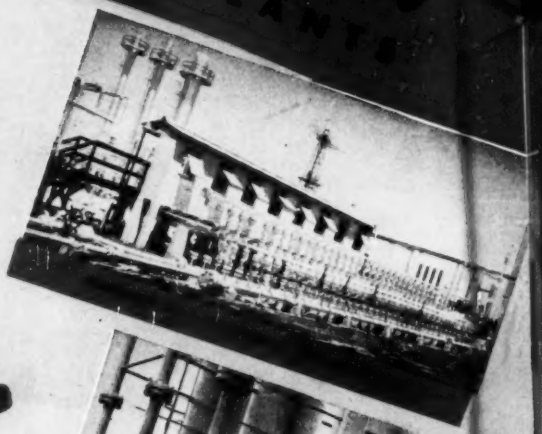

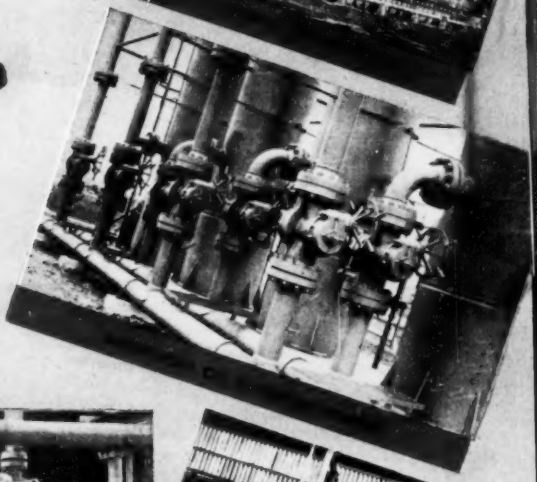

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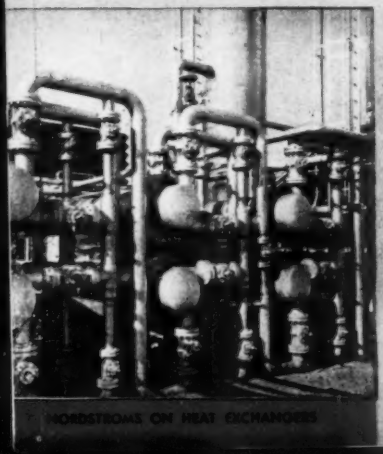
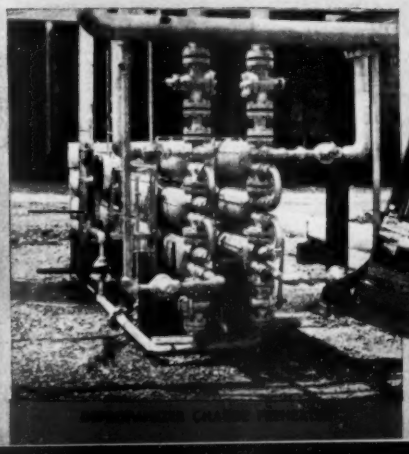
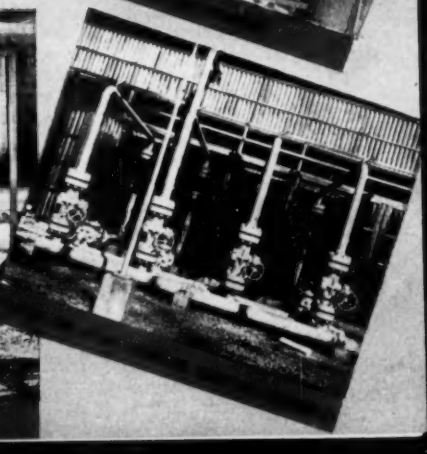


NORDSTROMS ON HEAT EXCHANGERS





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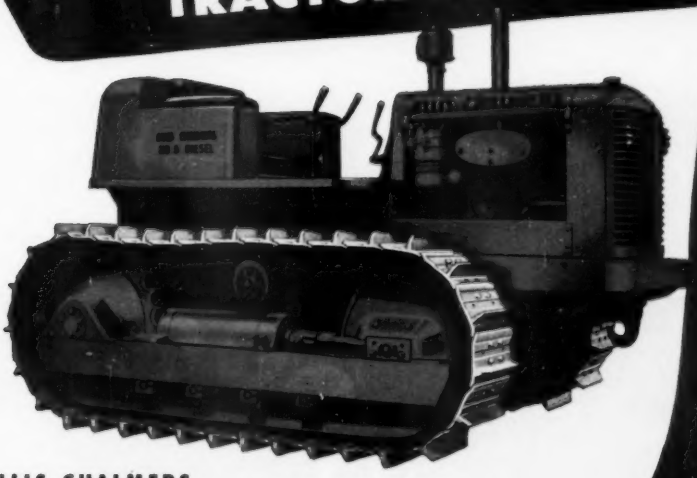

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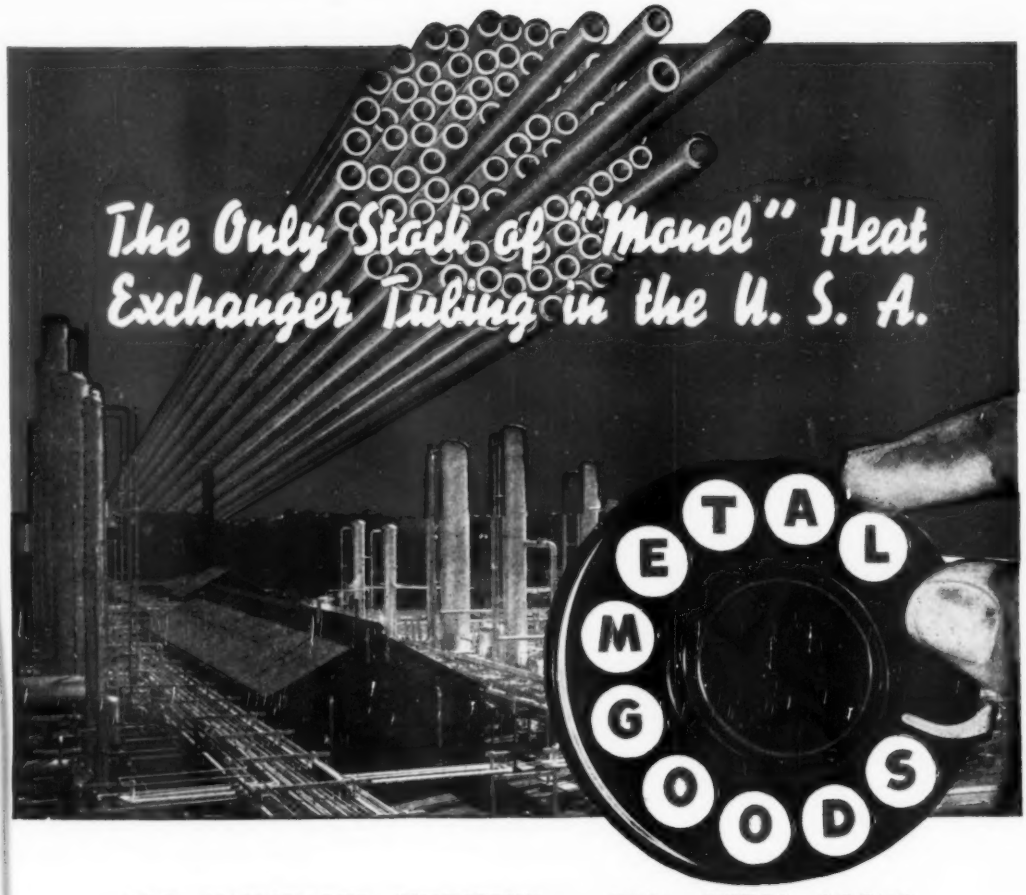

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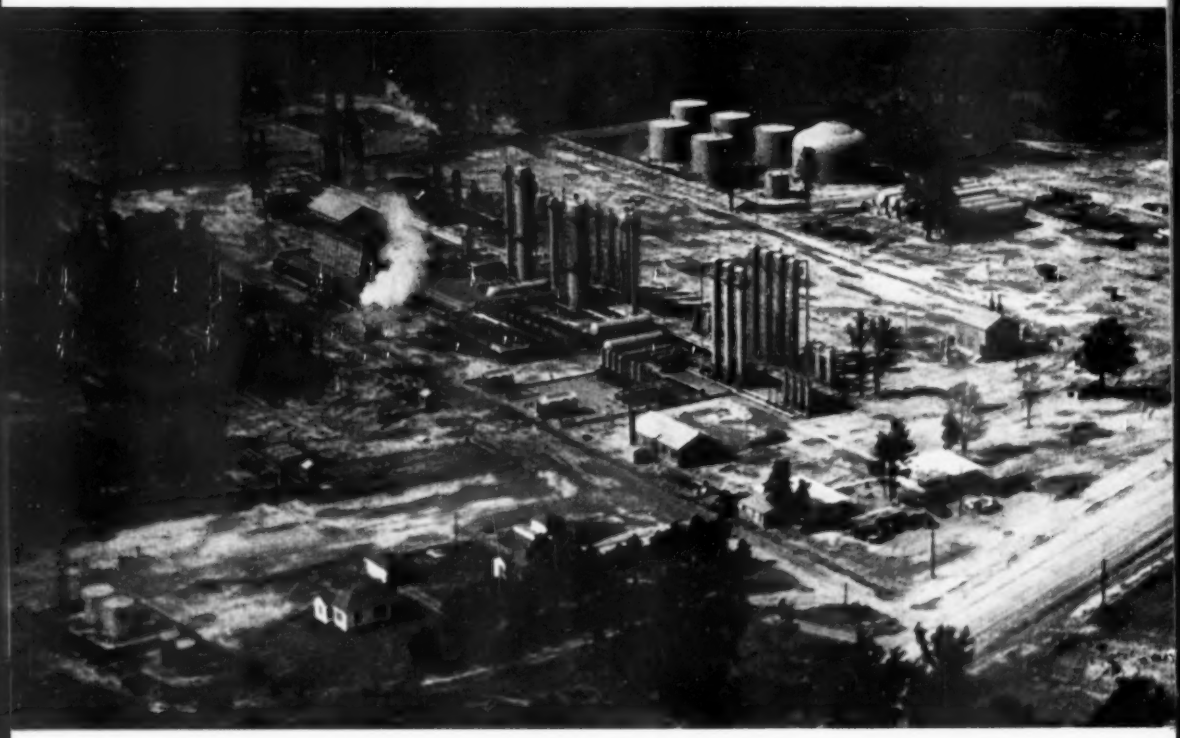
13 in '49

THIS PLANT OF *Carthage Corporation,*

now each day processing over a quarter of a billion cubic feet of high pressure gas from the Carthage gas-distillate field of East Texas, is one of 13 completed by HUDSON and placed in operation during 1949.



From Colorado to Alabama and abroad, at elevations from sea level to a mile, at atmospheric temperatures of minus 40° F to plus 110° F, under process pressures from high vacuum to 8000 pounds per square inch, HUDSON plants are demonstrating to their owners the experience and pride in workmanship which went into their design and building.

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...PRECISION BUILT...FIELD PROVEN

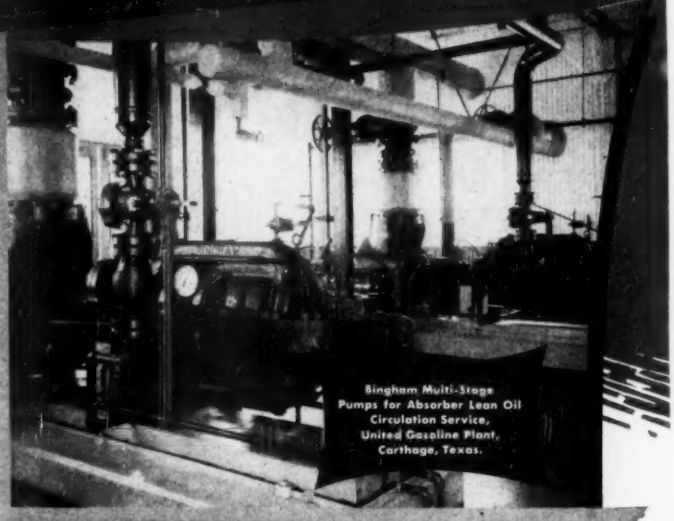
High Pressure Multi-Stage "Double Volute" Pumps

All Bingham Multi-Stage Pumps are of "Double Volute" design, insuring perfect radial balance—unusually short span between bearings—case bolts uniformly located close to shaft centerline—integral crossovers producing casings of maximum strength for high pressure service.

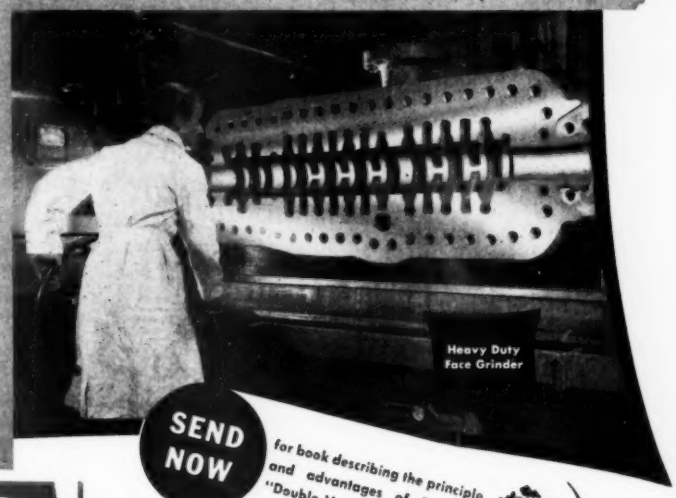
Bingham "Double Volute" Multi-Stage Pumps have been field proven for such high pressure service as Cold Charge Pumps, Boiler Feeders, Pipe Line Booster Stations, Absorber Lean Oil Circulation, and other applications requiring the utmost in sustained efficiency and low maintenance.

• • •

Bingham High Pressure Multi-Stage Pumps, like all Bingham products, are precision built. All parts requiring close tolerances are ground on heavy duty precision grinders. Pump case flanges of Multi-Stage Pumps are finished ground to a perfect degree of flatness by a heavy duty grinder, which is typical of the precision machinery in our new, modern plant.



Bingham Multi-Stage Pumps for Absorber Lean Oil Circulation Service, United Gasoline Plant, Carthage, Texas.



Heavy Duty Face Grinder

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Bingham PUMPS

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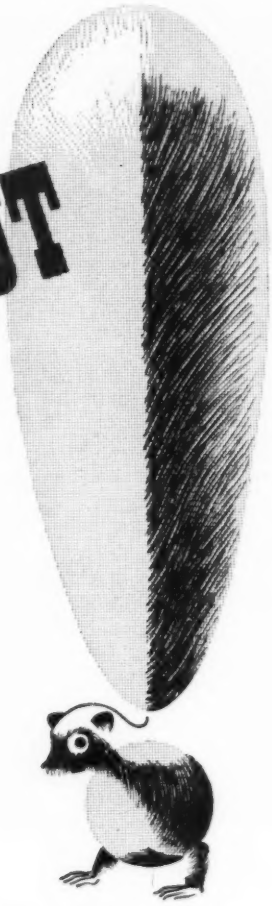

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As a leakage warning for natural or liquefied petroleum gas, Mallinckrodt Ethyl Mercaptan Purified gives you many advantages:

- SAFE—Its penetrating, skunk-like odor commands instant attention, but will not cause nausea or irritate eyes or mucous membranes.
- ECONOMICAL—So powerful, one pound will odorize 1,000,000 cubic feet of natural gas or a 10,000 gallon tank car of Propane or Butane.
- PROTECTS FIXTURES—Continuous rigid checks insure such moisture-free purity that Mallinckrodt Ethyl Mercaptan does not damage valves, gauges, etc.

MALLINCKRODT ETHYL MERCAPTAN PURIFIED { meets *all* 15 qualifications of National Bureau of Standards

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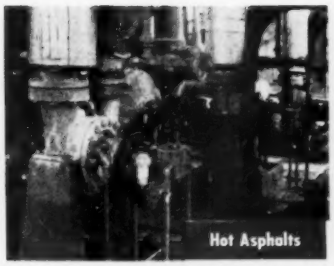

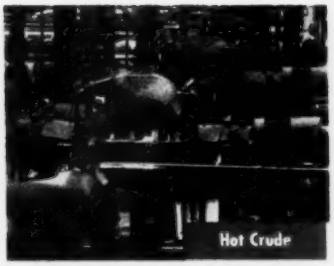

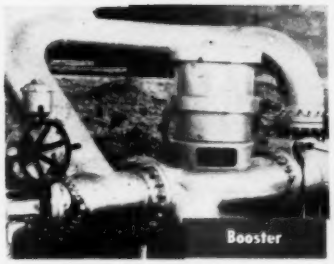

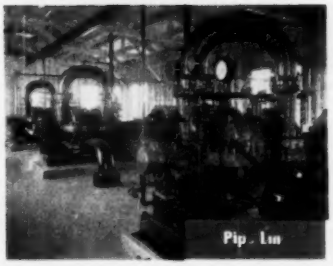

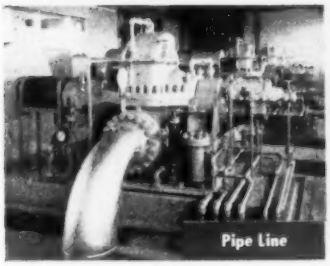

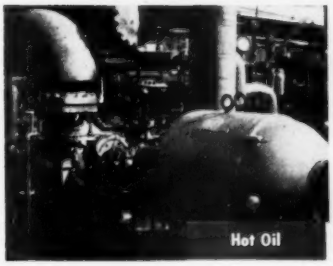

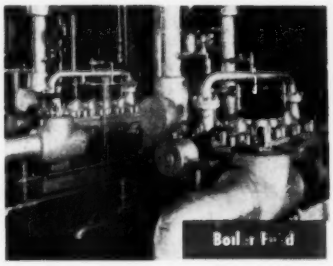

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United's unique engineering and manufacturing facilities are set up to tailor each pump to meet specific job requirements. This means custom-built performance without premium cost. *Yet basic United designs provide for maximum interchangeability of parts, easy accessibility, simplified maintenance.* Thousands of installations, from refineries to pipelines, are daily proving the dependability and efficiency of United Centrifugal Pumps . . . backed by over a quarter-century of specialized service to the oil industries. Make it a point to submit *your* pumping problems to United engineers, for only an engineered-to-the-job pump can assure you top performance—year after year. Contact your nearest United sales office today.

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Main Offices and Plants: **Oakland 7, California**

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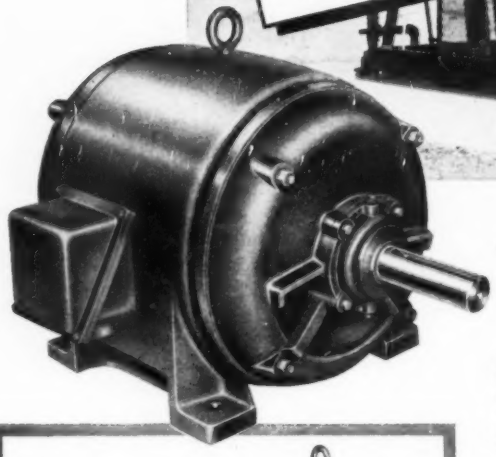
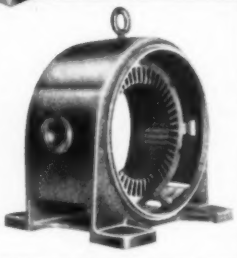
WAGNER MOTORS
...The choice of leaders in industry



Type DP (Drip-proof) oil well pumping motor. One-piece, cast iron frame designed so that any condensation will immediately drain out of ventilating openings at bottom of motor. Gasket sealed conduit box is dust-tight and waterproof.



...and Wagner Oil Well Pumping Motors have plenty of it!

Electric motors that drive oil well pumping rigs need plenty of stamina. They operate under a blazing sun, in driving rain, in freezing weather. They've got to supply unfailing power, under all these conditions, day in and day out with the very minimum of maintenance and attention. Yes, oil well pumping motors *have* to be tough. That's why so many dependable Wagner Oil Well Pumping Motors are on the job in the oil fields.

Wagner polyphase motors for oil well pumping are built in three electrical types: Normal torque, normal slip; High torque, normal slip; and High torque, high slip. Any type can be provided with Drip-proof, Splash-proof, or Totally-enclosed fan cooled protective enclosures. For applications requiring single-phase motors, Wagner can furnish capacitor-type motors.

Twenty-nine branch offices, located in principal cities, are ready to help you whenever you have a motor problem. Users of Wagner Motors also profit by nationwide service facilities. Bulletin MU-185 gives information on the complete line of Wagner Motors.

WAGNER ELECTRIC CORPORATION
6389 Plymouth Ave., St. Louis 14, Mo., U.S.A.

Wagner Electric Corporation
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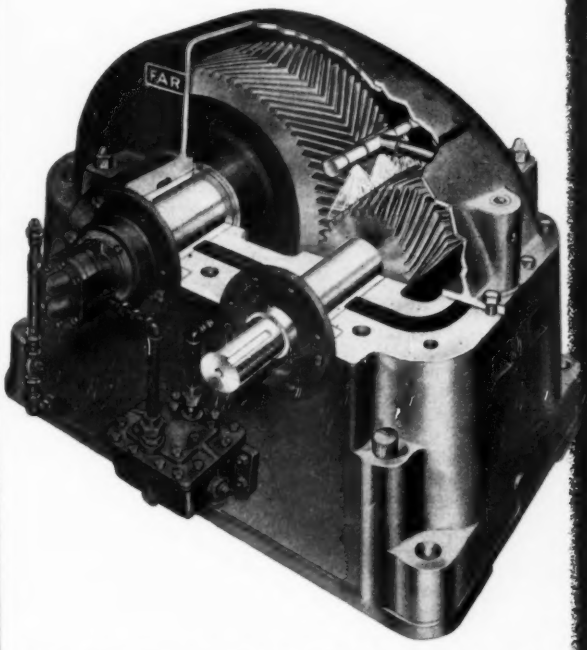
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 29 PRINCIPAL CITIES

MU-4

5 REASONS WHY
FARREL® SPEED INCREASERS "LAST FOREVER"



While we cannot *guarantee* that Farrel type SI units will *last forever*, it is beginning to look as though they will.

Since 1932, when we first developed a standard series of speed increasers for pipe-line pumping service, hundreds of these units have been installed throughout the oil industry. *Every one of these units is still in operation,* performing as well as on the day it was put into service.

For full information about these *time-proved* speed increasers, write for your copy of Bulletin No. 448. No cost, no obligation.

FARREL-BIRMINGHAM COMPANY, INC., 344 Vulcan St., Buffalo 7, N.Y.

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FB-577

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A "FOUNTAIN OF YOUTH"

PRECISION-GROUND SHAFTS

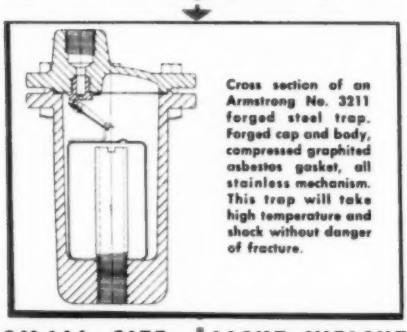
OVERSIZE SLEEVE BEARINGS

EXCEPTIONALLY RIGID HOUSING

"Here's a Forged Steel Trap . . . for only $14.00 list"

SMALL PRICE
BIG BENEFITS

SAFETY . . . DEPENDABILITY



Cross section of an Armstrong No. 3211 forged steel trap. Forged cap and body, compressed graphited asbestos gasket, all stainless mechanism. This trap will take high temperature and shock without danger of fracture.

SMALL SIZE . . . LIGHT WEIGHT

NOW, for many applications, refineries and natural gasoline plants can have the additional safety of a forged steel steam trap for only a few dollars more than a cast iron trap of comparable size. The Armstrong No. 3211 trap illustrated will withstand fire or explosion without danger of fracture. It is the baby of the Armstrong forged steel line, a low priced trap for working pressures up to 250 psi; design pressure, 450 psi. Capacity range 750 to 1000 lbs/hr continuous. ½" or ¾" pipe connections. Diameter 4¼"; height 7"; weight 8 lbs. This trap is a natural for refinery and natural gasoline plant service.

For higher pressures and larger capacities Armstrong builds a complete line of heavy duty forged steel traps. Ask your nearby Armstrong representative to quote on the traps you need now.

ARMSTRONG MACHINE WORKS
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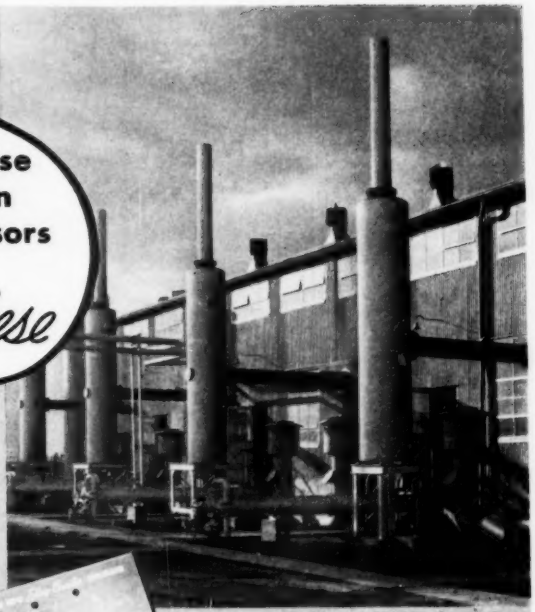
SEND FOR your copy of the Armstrong Steam Trap Book giving complete data and prices on all Armstrong steam traps, both forged and cast bodies for all pressures, all applications. This 36-page book is a valuable reference for any engineer working with selection and installation of steam traps.

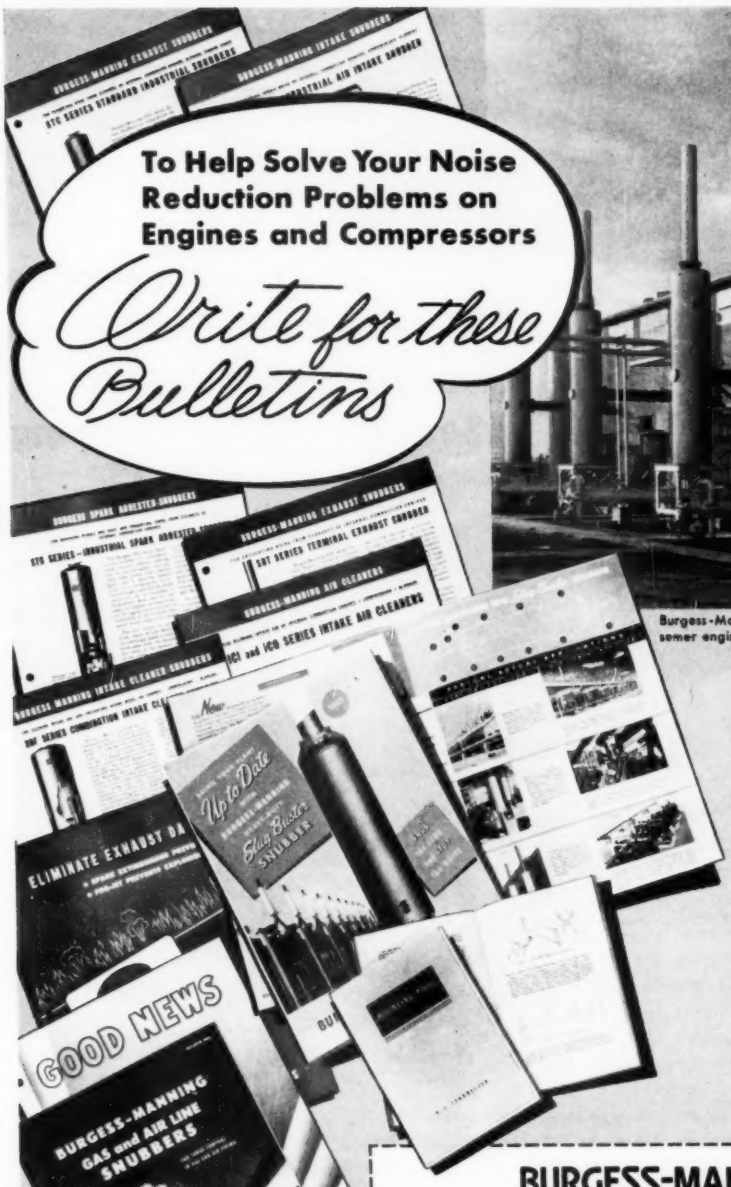
ARMSTRONG STEAM TRAPS

To Help Solve Your Noise Reduction Problems on Engines and Compressors

Write for these Bulletins



Burgess-Manning Snubbers on 1000 hp Cooper-Bessemer engines of the Panhandle Eastern Pipe Line Co.



SNUB THE SLUG AND STOP THE NOISE

Quiet engine and compressor operation can be assured when using Burgess-Manning exhaust and air intake Snubbers. Noise is prevented by the Snubber which dissipates the energy in the exhaust gas slugs and smooths the intake air . . . providing quiet operation without affecting performance. A complete line of air intake and exhaust Snubbers is available. Snubbers for these applications are discussed in the bulletins shown on the left. Indicate the ones you want on the coupon below and send it in, today.

BURGESS-MANNING COMPANY

Libertyville, Illinois

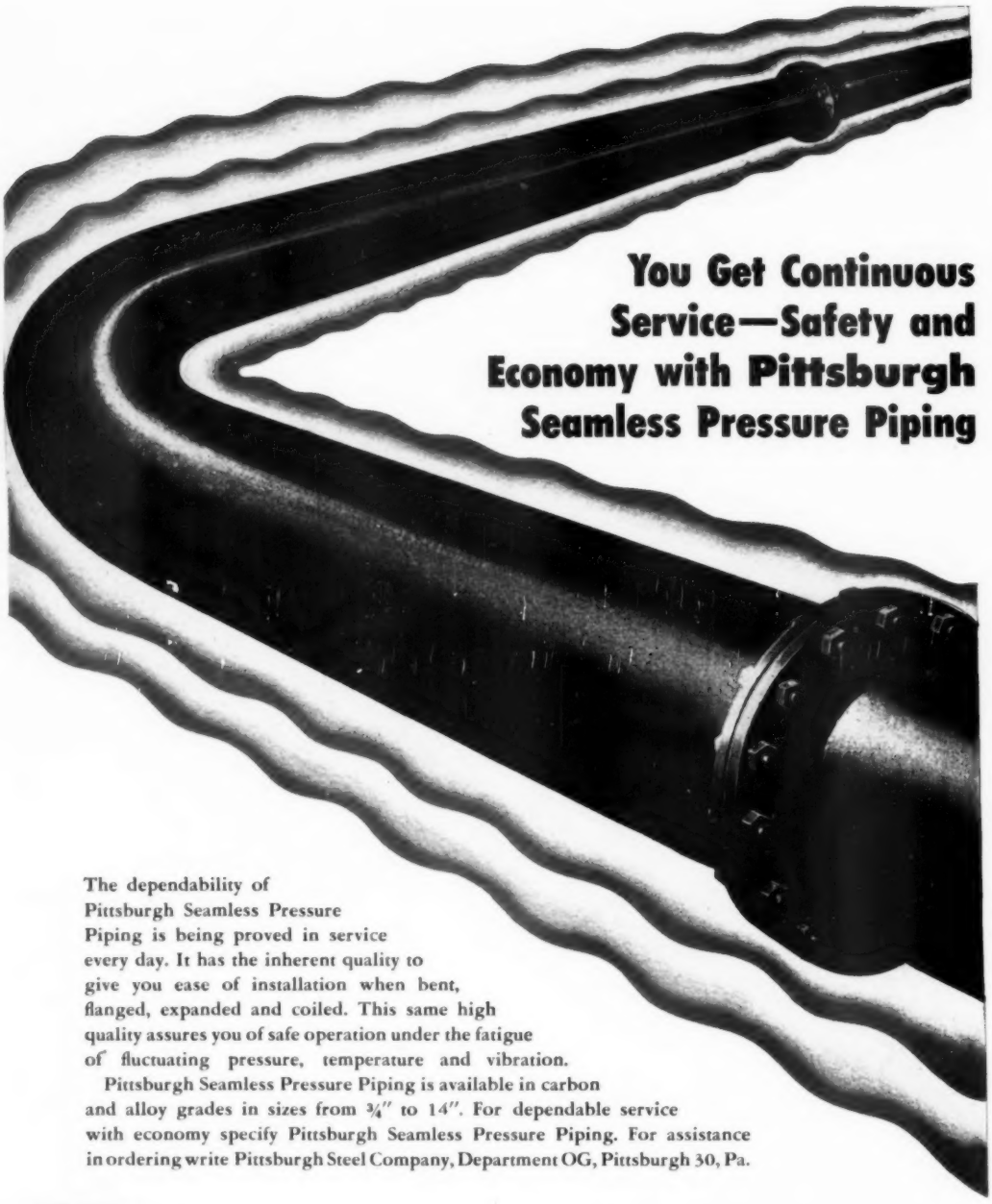
Please send me the following bulletins:

- ☐ Bring Your Plant Up To Date SDG Exhaust Snubber
- ☐ Bouncing Pipes
- ☐ Gas and Air Line Snubbers
- ☐ Spark Arrester-Snubber
- ☐ Eliminate Exhaust Danger SDL Fog-Jet Snubber
- ☐ Terminal Exhaust Snubber
- ☐ Standard Industrial Snubber
- ☐ Intake Cleaner-Snubber
- ☐ Intake Snubber
- ☐ Intake Cleaner-Snubber—Manifold Type
- ☐ Intake Air Cleaners

Name_____

Company_____ Address_____

City_____ State_____



You Get Continuous Service—Safety and Economy with Pittsburgh Seamless Pressure Piping

The dependability of Pittsburgh Seamless Pressure Piping is being proved in service every day. It has the inherent quality to give you ease of installation when bent, flanged, expanded and coiled. This same high quality assures you of safe operation under the fatigue of fluctuating pressure, temperature and vibration.

Pittsburgh Seamless Pressure Piping is available in carbon and alloy grades in sizes from ¾″ to 14″. For dependable service with economy specify Pittsburgh Seamless Pressure Piping. For assistance in ordering write Pittsburgh Steel Company, Department OG, Pittsburgh 30, Pa.

PITTSBURGH SEAMLESS PRESSURE PIPING

a product of

Pittsburgh Steel Company

You already know how U. S. Savings Bonds are building future security for each Bond holder. You know that at maturity each Bond will return $4 for every $3 he invests.

But have you realized how much you can help to assure the future security of <u>your company</u> by vigorously promoting your Payroll Savings Plan?

IT WORKS TWO WAYS

First—by boosting employee-participation in the Plan, you increase the security, stability, and effectiveness of your personnel group. More than 20,000 companies with Payroll Savings know that corporate success is tied directly to the security of its individual employees. Your workers who invest in Bonds as a hedge against their own personal financial contingencies will enjoy greater peace of mind—will be more contented, more careful, and more productive on the job. Your company will benefit from the resulting decrease in absenteeism, labor turnover, and accidents.

Secondly—you help to strengthen the national economy from which your company must continue to draw its profits. Bond dollars represent a tremendous backlog of deferred purchasing power—dollars that will buy your products in the years to come! Furthermore, Savings Bond sales spread our national debt.

FIVE STEPS THAT BUILD SECURITY

1. See that a top management man sponsors the Plan.

2. Secure the help of the employee organizations in promoting it.

3. Adequately use posters and leaflets and run stories and editorials in company publications to inform employees of the Plan's benefits to them.

4. Make a person-to-person canvass once a year, to sign up participants.

These first four steps should win you 40-60% participation Normal employee turnover necessitates one more step:

5. Urge each new employee, at the time he is hired, to sign up.

The experience of companies throughout the nation indicates that at least half of your employees can be persuaded to join—without high-pressure selling. All the help you need is available from your State Director, U. S. Treasury Department, Savings Bonds Division. He is listed in your phone book.

The Treasury Department acknowledges with appreciation the publication of this message by

THE OIL AND GAS JOURNAL
TULSA 1, OKLAHOMA

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and The Advertising Council.

Cycoils always bat in the "Clean up" spot

WHEREVER there's a big investment at stake, the job of dust protection is invariably left to dependable Cycoil* Oil Bath Air Cleaners. At this Odessa, Texas TXL gasoline plant, 44 Cycoils are placed in the "clean up" spots at the air intakes for 22 Clark Brothers engines.

Cycoil goes all out in its battle against dust. Even before the air reaches the filter pads, over 90% of its fine dust content is trapped by the oil bath action. When you add positive oil circulation for continuing self-cleaning action, plus the added filtration supplied by the filter pads, the net result is approximately 100% clean air.

If you want to give your engines or compressors complete, continuous protection put Cycoils in the "clean up" spot. They have never failed to deliver a winning performance against dust. For complete information, write for Bulletin 130-D.

AMERICAN AIR FILTER COMPANY, INC.
444 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

** Oil bath air cleaner*

AAF® Cycoil® OIL BATH AIR CLEANER
AND INTAKE SILENCER

Cut Petroleum Pumping Costs With *Electrifugal* PUMPS

1 SAVE ON INSTALLATION! *Electrifugal* pump comes ready to connect and run. No extra parts. Easy to handle. Requires small installation space.

2 SAVE ON OPERATION! Pump and motor designed together for high efficiency. Every unit tested at factory and guaranteed to deliver rated capacity.

3 SAVE ON MAINTENANCE! Motor and pump have single shaft — assuring perfect and permanent alignment. Parts easily accessible. Has fewer parts and machined fits.

Electrifugal and *Texrope* are Allis-Chalmers trademarks.

OVER 42,000,000 GALLONS OF PETROLEUM PRODUCTS are pumped annually through 15 Allis-Chalmers close-coupled pumps at this new midwest bulk station.

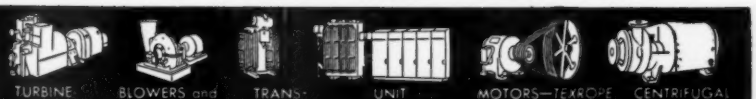
Distribution failures are avoided through the dependable service of these "one-package" pump-motor units. Bronze wearing ring protects casing from wear and is easily replaced when required.

Electrifugal pumps range from 10 to 1600 gpm with heads to 525 ft. For information, see your Allis-Chalmers Authorized Dealer or Sales Office. Or write for Bulletin 52B6059E. A-2974

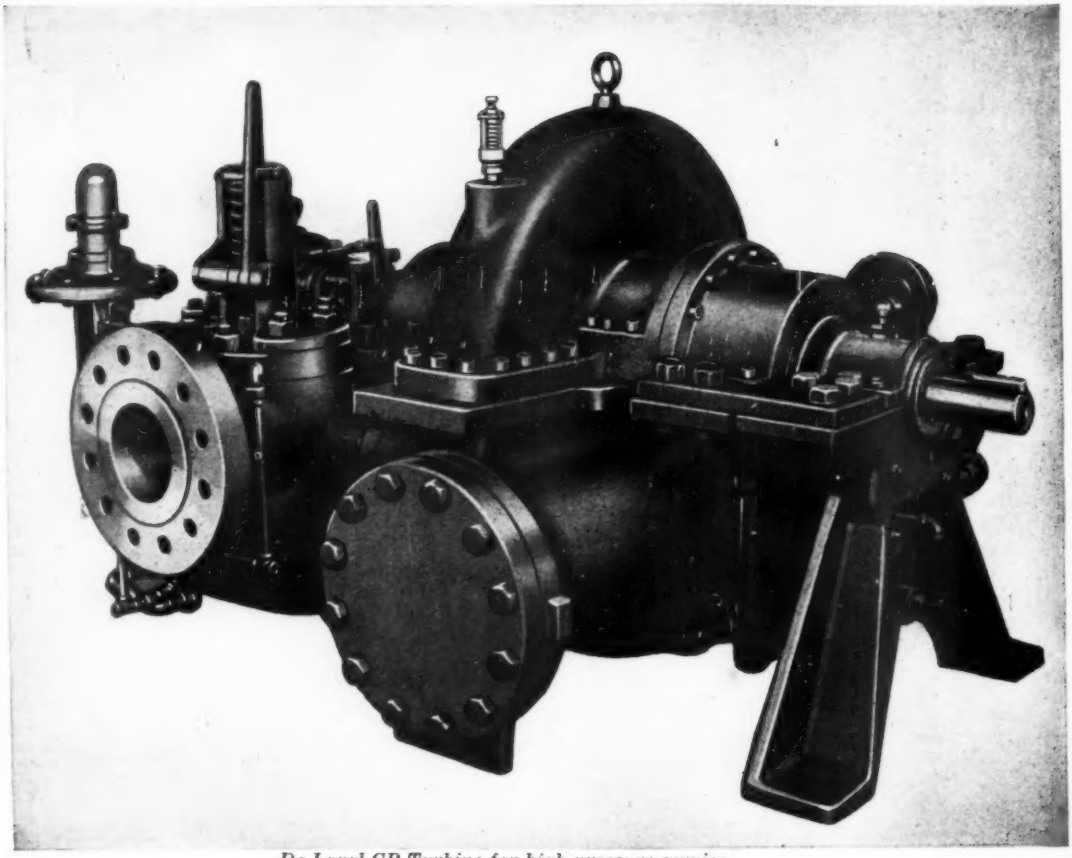
ALLIS-CHALMERS, 1059A SO. 70 ST. MILWAUKEE, WIS.

ALLIS-CHALMERS

Power, Electrical, Processing Equipment for Petroleum Industry



A NEW SINGLE-STAGE ESPECIALLY FOR HIGH



De Laval CP Turbine for high pressure service.

Initial Pressures to 1450 psig... Back Pressures to 300 psig

This new, high pressure single-stage turbine is designed for initial pressures to 1450 psig and back pressures to 300 psig. It is more than an ordinary single-stage turbine in a "beefed up" high pressure casing. It is the *first* single-stage, mechanical drive turbine with all labyrinth shaft seals of the type generally used in large, multi-stage turbines especially designed for high pressure service.

For more complete description and specifications,

Send for Bulletin 4215-33-0G

TURBINE DESIGNED PRESSURES

The FIRST Single-Stage Turbine with all-labyrinth shaft sealing

Steam leakage along the shaft is effectively prevented by a labyrinth seal consisting of a series of shaft grooves and mating tongues of stainless steel packing. The number of labyrinths in the shaft depends upon the exhaust pressure rating —as many as 52 labyrinths per side being employed for the highest pressures. These horizontally-split, spring-loaded segments of corrosion resistant labyrinth are held in T slots from which they can be removed and easily replaced.

The De Laval Labyrinth prevents leakage more effectively, reduces losses, lasts longer (because there's no rubbing contact) and requires less maintenance.

WHEN YOU BUY A DE LAVAL CP TURBINE YOU ALSO GET...

1. True center-line support

To provide for thermal expansion encountered in high temperature service, the turbine is supported at the exact centerline and the front end is mounted on a flexible channel. Because of this method of mounting both radial and axial expansion can take place without disturbing the shaft centerline.

2. Choice of eight governing systems

Eight different types of governors can be furnished including: mechanical shaft, vertical flyweight with or without oil relay, hydraulic with or without oil relay, pressure governors for pump and blower drives and auxiliary tripping devices.

3. Independent, positive over-speed trip

A separate, independent trip operating entirely independently of the governing system gives positive protection against over-speeding

4. Horizontally-split casing with steam chest in bottom half

The casing, packing glands and bearings are split at the centerline and the steam chest is located in the lower half of the casing so that the cover can be lifted without disturbing piping connections.

The De Laval CP Turbine is made in three sizes for capacities up to 2000 hp.

DE LAVAL STEAM TURBINE COMPANY
TRENTON 2, N. J.

TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS • CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS

T-33

R/M no. 303
a high-temperature valve stem packing

R/M No. 303 is a packing widely used in oil refining. It is specifically designed for use on valve stems and in expansion joints handling superheated steam or hot gases at temperatures up to 900°F. The core is of large graphite particles which are not affected by heat, but which provide the necessary compressibility. A jacket of pure asbestos yarns, reinforced with Monel wire, is braided over the core and treated with a high temperature, non-fluid type of binder. The outer surface is finished with flake graphite.

RAYBESTOS-MANHATTAN, INC.

PACKING DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.

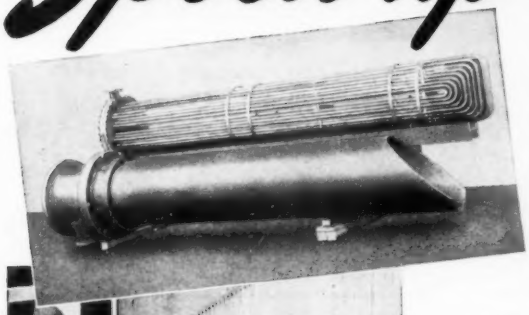
RAYBESTOS-MANHATTAN, INC., Manufacturers of Packings • Asbestos Textiles • Mechanical Rubber Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Powdered Metal Products • Bowling Balls

Raybestos-Manhattan, Inc. 0-40
Packing Division, Manheim, Pa.
Gentlemen: Please send me data on R/M No. 303.

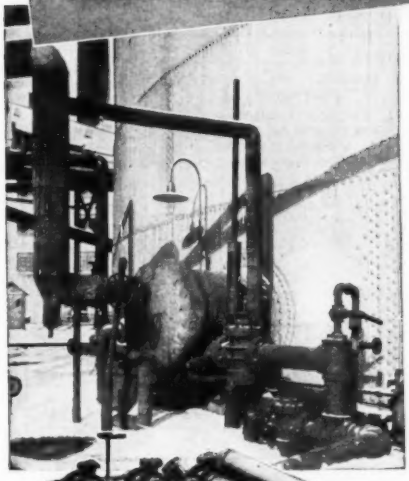
Name_____
Position_____
Company_____
Address_____
City_____ Zone____ State_____

R M

Speed up Oil Flow



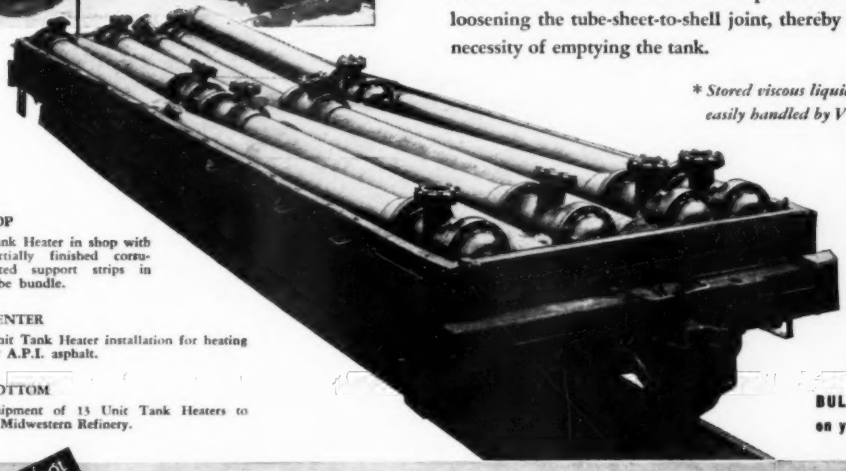
WITH Vogt UNIT TANK HEATERS *



SAVE TIME AND MONEY with Vogt Tank Heaters! They permit pumping to be started shortly after steam is admitted since only the small quantity of oil lying in the shell of a unit needs to be heated. As hot oil is withdrawn it is replaced by cold oil from the tank through the open end of the heater shell. Steam consumption is held to a minimum since *only* the oil removed from the tank is heated.

Standard Type U Heaters have nests of "U" bend tubes made from 1¼" seamless steel or 1" electric welded pipe, as desired. These are rolled firmly into tube sheets having double grooved tube holes. Corrugated strips support the tubes without impediment to the oil flow. Collar bolts permit removal of the steam head for inspection or repair without loosening the tube-sheet-to-shell joint, thereby eliminating the necessity of emptying the tank.

** Stored viscous liquids of any kind are easily handled by Vogt Tank Heaters.*



TOP
Tank Heater in shop with partially finished corrugated support strips in tube bundle.

CENTER
Unit Tank Heater installation for heating 12 A.P.I. asphalt.

BOTTOM
Shipment of 13 Unit Tank Heaters to a Midwestern Refinery.

Write for BULLETIN HE-4 on your letterhead

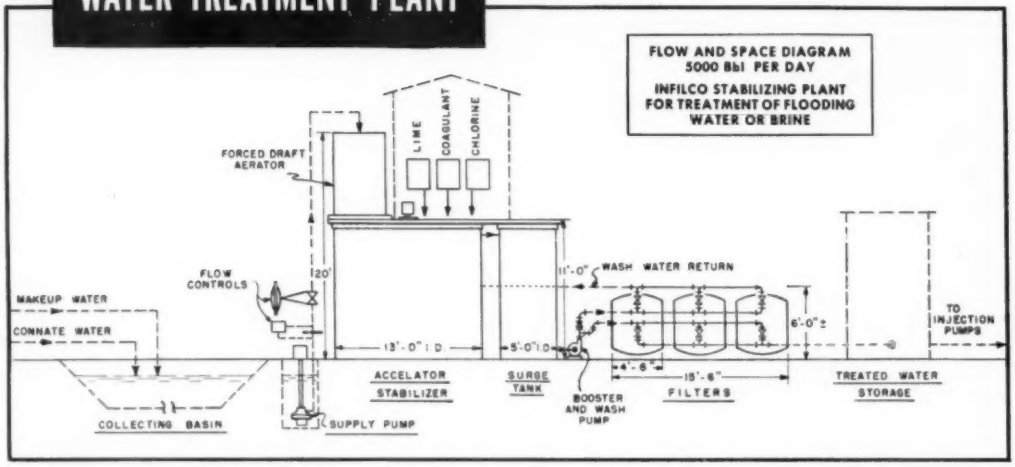
HENRY VOGT MACHINE CO., INC., LOUISVILLE 10, KY.

Branch Offices: NEW YORK - CHICAGO - CLEVELAND - PHILADELPHIA - DALLAS

Water Flooding for Oil Recovery?
Disposal of Oil Field Brine?

You Need a Compact, Effective, Economical INFILCO WATER TREATMENT PLANT

- **Chemical mixing, flocculation, and separation of precipitated solids effected in a single unit.**
- **Chemical stability established through contact with recirculating slurry.**
- **Automatic control of chemical feeds.**
- **No waste of filter wash water.**



RESULT.. Crystal clear, chemically stable water ideally suited for flooding or disposal purposes—whether your supply is well, lake, stream or connate water.

The success of your flooding or disposal operation depends upon the quality of the water injected. Don't take chances with improperly treated water that can clog the formation by (1) suspended solids, (2) chemical reaction products, (3) organic growths on the face of the formation.

Write Infilco, Chicago, or call in our nearest field engineer. Learn how our free laboratory and water analysis service, together with Infilco Water Conditioning Equipment can assure the success of your flooding or disposal operation.

INFILCO

• BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1894 •

INFILCO INC.

GENERAL OFFICES: 325 WEST 25th PLACE • CHICAGO 16, ILLINOIS

SALES OFFICES IN TWENTY SIX PRINCIPAL CITIES

WORLD'S LEADING MANUFACTURERS OF WATER CONDITIONING AND WASTE TREATING EQUIPMENT

EYES that see 5 MILES AWAY!

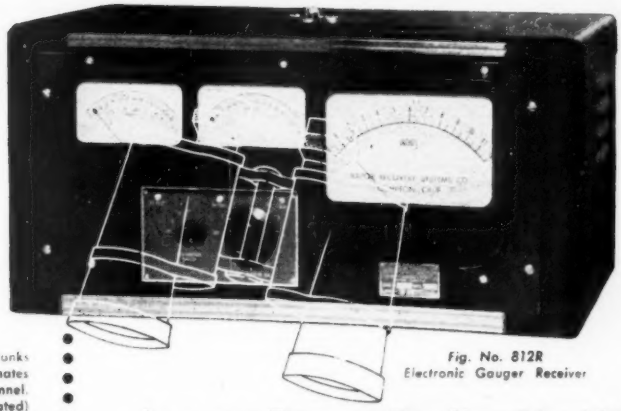


Fig. No. 812R
Electronic Gauger Receiver

Accurate Remote Reading Liquid Levels with the "VAREC" Electronic Gauger

No magic, but "VAREC" 's application of the science of electronics to the problem of tank gauging is now giving users the utmost in safety, convenience and accuracy in obtaining liquid levels at a distance from their tanks.

The "VAREC" Electronic Gauger Receiver illustrated is the multi-tank *explosion-proof* model on which you can gauge any one of 24 tanks by a twist of your fingers. Power is on only at the tank being gauged. Behind the front panel, all electrical components and wiring are enclosed in an explosion-proof housing. Wire count to the tanks is less than that of any other remote gauging system and wire size is smaller due to the low current used.

Investigate this "VAREC" Electronic Gauger for your own gauging problem. Write today for a copy of "Remote Gauging at its Best!" and call in a "VAREC" Representative.

FEATURES

SAFE . . . No climbing slippery tanks during wet or icy weather—eliminates toxic gas hazard for personnel. *Explosion-proof* Receiver (illustrated) designed in accordance with standards for industrial control equipment as used in hazardous areas. Transmitter's electrical section completely isolated from tank vapors. Built to meet requirements of explosion-proof equipment.

ACCURATE . . . Accuracy is only limited by type of float gauge used. Measures liquid levels to ±1/16th inch with "VAREC" 253 Series Automatic Tank Gauges.

ECONOMICAL . . . Low initial cost; low installation cost; low maintenance cost. Pays for itself in manhours saved.

EASY TO USE . . . No waiting to take readings—you need only select the tank for a momentary or continuous accurate gauge reading. Instruments do not require resetting after power shutdown.

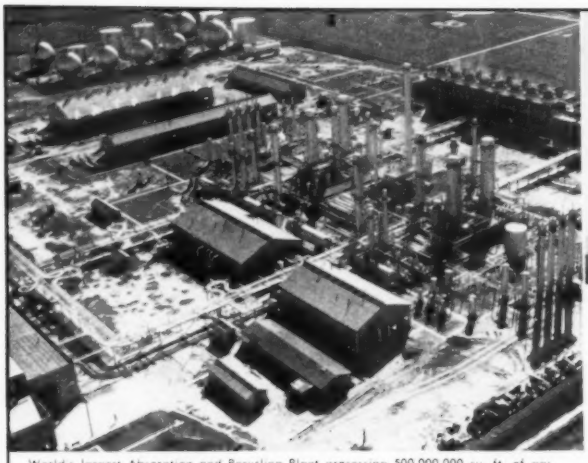
TROUBLE FREE MAINTENANCE. Designed to operate many years without service. Electronic elements function at ½ to ½ rated capacities. Plug-in parts easily replaceable.

INSTALLATION AND SERVICE POLICY. Engineering supervision of installation is available. Annual or biennial factory routine service check offered at nominal charge.

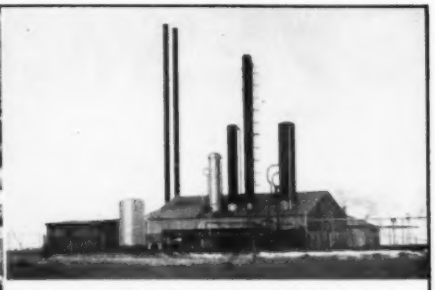
PROVED and APPROVED "Varec"

P-15

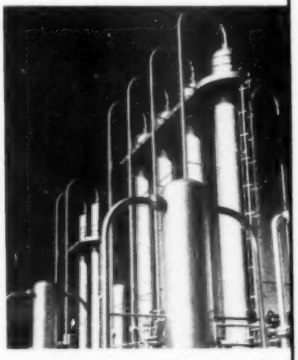
THE VAPOR RECOVERY SYSTEMS CO.
COMPTON, CALIFORNIA, U. S. A.
Cable Address: VAREC COMPTON USA (All Codes)
New York • Boston • Pittsburgh • Chicago • Detroit • St. Louis • Houston
Tulsa • Casper, Wyo. • Provo, Utah • Los Angeles • San Francisco • Seattle



World's largest Absorption and Recycling Plant processing 500,000,000 cu. ft. of gas per day. Located on the Gulf Coast.



Absorption Plant near Canadian border includes many provisions for efficient, continuous operation under severe winter conditions—temperatures to minus 50° F.



Absorbers—2000 lb. working pressure, operating at 1800 lbs. Residue gas compressed to 3500 p.s.i.g. for injection. Plant located in Texas.

SCOPE!

No matter how small or how large a natural gasoline plant you plan—or what operating or climatic conditions are involved—STEARNS-ROGER has ***proved ability*** to meet the problem.

Engineering, Design, Manufacturing, Construction: one source and one undivided responsibility from start to finish.

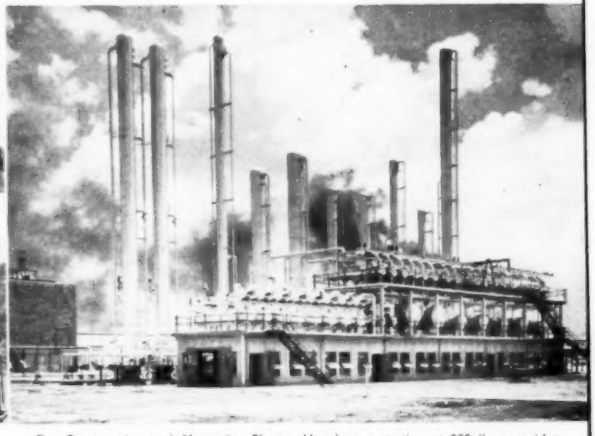
Stearns-Roger

THE STEARNS-ROGER MFG. CO. DENVER COLORADO

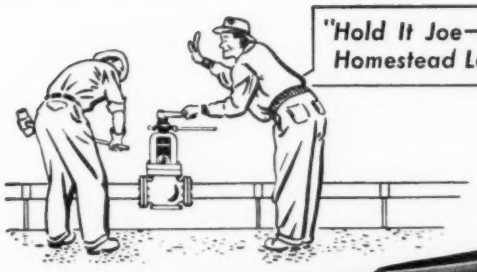
HOUSTON OFFICE, CITY NATIONAL BLDG. • EL PASO OFFICE, RADIO BLDG.

Texas Panhandle Absorption Plant built for extremely low pressure. Constructed in 1933.

Absorption Plant built in 1929 to process 10,000,000 std. cu. ft. of wet gas per day in northern Louisiana.



Gas Conservation and Absorption Plant—Absorbers operating at 800 lbs.—residue gas compressed to 5500 p.s.i.g. from 10" vacuum inlet pressure. On Texas Gulf Coast.



Homestead

LEVER-SEALD Valves

ALWAYS WORK
LAST LONGER
COST LESS PER YEAR

STICKING valves are never a problem with Homestead Lever-Sealds on the job. Built into each valve is a powerful leverage, ready at all times to overcome the effects of corrosion, viscous fluids or temperature and pressure extremes which cause ordinary valves to stick or "freeze."

This powerful leverage not only relieves pressure between the seating surfaces to permit operation under all conditions; but it also is the means of providing the extra tight seal against leakage—the seal which keeps corrosive or erosive line fluids away from the seating surfaces; assures longer valve life and lowest cost per year.

Made in stainless steel, steel, semi-steel, bronze, monel or other alloys suitable for the working conditions under which they are to be used, Homestead Lever-Seald Valves may be had in sizes from 1" to 12"; and for working pressures from 150 pounds to 1500 pounds.

Choose the sizes and types for your services from Reference Book 39 Section 3. Write for your free copy today.

Check these Outstanding Features:

A QUARTER-TURN fully opens or closes valve.

INSTANT STICK-PROOF OPERATION. Plug turns freely after seating pressure is relieved by screw lever.

POSITIVE LEAKLESS SEAL is obtained by applying full seating pressure with screw lever after opening or closing.

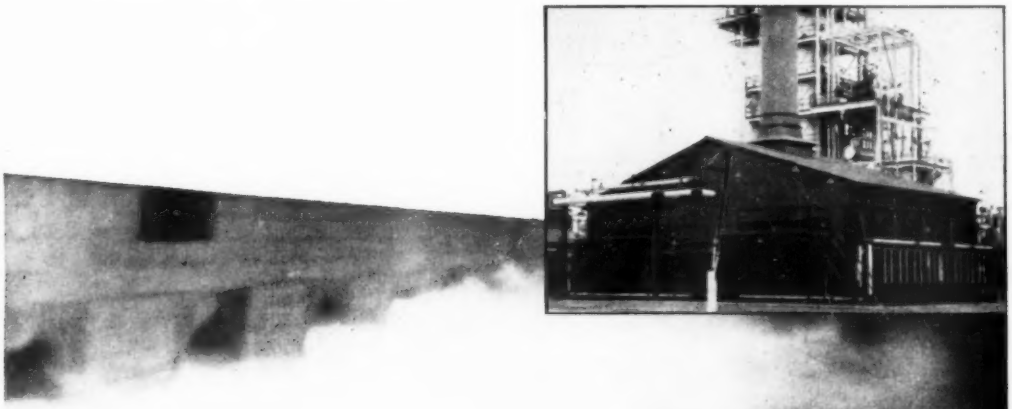
LEAK PROOF. Deep stuffing box, gland and sealed bottom prevent fluid loss, and reduce hazards.

STRAIGHT-LINE FLUID FLOW. Little or no pressure drop.

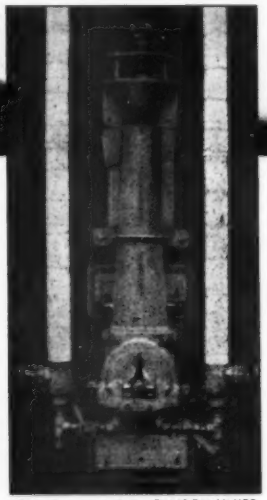
SEATING SURFACES ALWAYS PROTECTED in both open and closed positions. Fluid or grit cannot damage valve seat.

HOMESTEAD VALVE MANUFACTURING CO.

P. O. BOX 403 CORAOPOLIS, PENNA.



80 MILLION B.T.U.'s PER HOUR . . .



Showing one of the TANDEM UNITS in action . . . and photo at top right is an exterior view of the Crude Heater.

WITH NATIONAL AIROIL OIL-GAS TANDEM COMBUSTION UNITS

The unretouched photograph above shows the interior of one end of a double-ended Crude Heater Furnace. Each end of this furnace is fired with eight (8) National Airoil "Airocool" Gas and Oil TANDEM COMBUSTION UNITS. Note how controlled *fuel oil* flames remain horizontal throughout the correct length of flame for maximum radiant absorption without impingement on bridge wall tubes.

The TANDEM UNIT has a high turn-down ratio with a steady flame . . . maintains high flame temperature with either fuel oil or gas; can be brought quickly to full capacity with a clean fire.

Mechanical Atomizing Oil Burners • Steam Atomizing Oil Burners • Refractory Burner and Muffle Blocks • Industrial Gas Burners • Low Air Pressure Oil Burners • Fuel Oil Pump Sets

NATIONAL AIROIL BURNER CO., INC.

Main Offices & Factory: **1236 EAST SEDGLEY AVENUE PHILADELPHIA 34, PA.**

SOUTHWESTERN DIVISION: 2512 SOUTH BOULEVARD HOUSTON 6, TEXAS

You can depend on PARKERSBURG PUMPERS For DEPENDABLE PERFORMANCE

Remote, hard-to reach locations are the acid test of pump performance. And that is where the industry-famous dependability of Parkersburg Pumping Units really pays off. Hour after hour, month in and month out they run smoothly on, never faltering in their lonely vigil of production. Experience has proved you can trust Parkersburg Pumpers for dependable performance.

Confidence in the dependability of Parkersburg Pumpers is the result of many greatly advanced refinements in their design and construction. The Parkersburg O.C.S. chain driven pumper, illustrated, has the high efficiency of roller chains and roller bearings in totally enclosed self-oiling units. First stage power reduction is made by V-Belt drive, while slower speed reductions are made by multiple roller chain systems running in an oil bath.

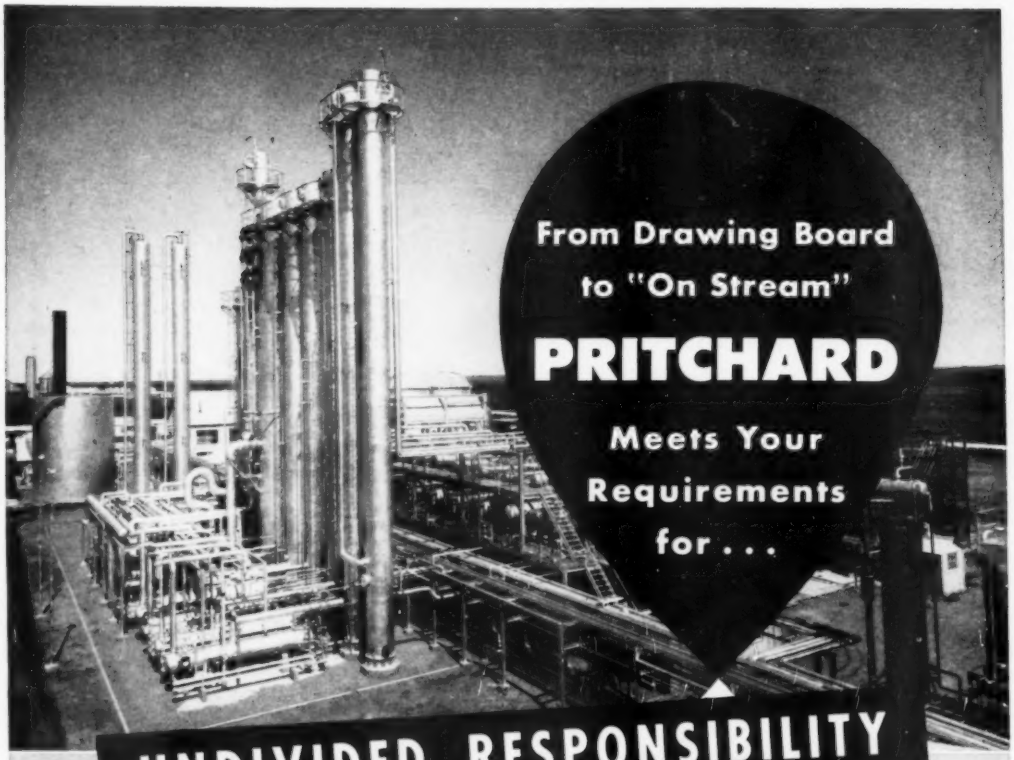
Sprocket shafts are supported by adjustable, self-aligning tapered roller bearings. Wrist pin bearings are also tapered roller bearings. Saddle and tailboard bearings are weather-proof, self-oiling type. Units can be equipped with electric motors or multi-cylinder engines. They are completely skid mounted for ease of installation and portability.

Ask your nearest Parkersburg representative for additional information about Parkersburg Pumpers.

THE PARKERSBURG RIG & REEL CO.
PARKERSBURG, WEST VA.

5005

PARKERSBURG



From Drawing Board to "On Stream"

PRITCHARD

Meets Your Requirements for . . .

UNDIVIDED RESPONSIBILITY

Photo above shows a recently completed Natural Gas Dehydration and Gasoline Recovery Plant which was designed, engineered and constructed by Pritchard. It has a capacity of 140,000,000 SCF per day Natural Gas Dehydration, 90,000,000 SCF per day National Gasoline Recovery, 110,000 gallons per day total products.

THREE FUNCTIONS — Engineering, Construction, Manufacturing

J.F.P Co.

IN FIVE FIELDS — Serving the CHEMICAL, POWER, PETROLEUM and GAS industries as well as providing specialized EQUIPMENT for all industries.

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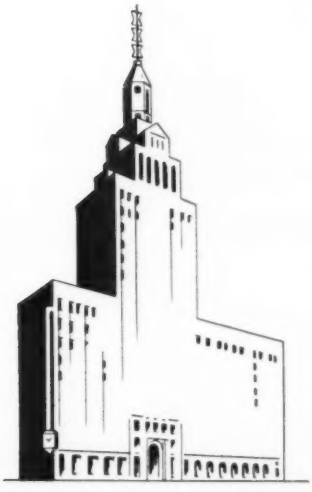
See NBT for a Prompt Decision on Oil Loans



If you're planning new drilling operations — or any other oil industry activity — come to National Bank of Tulsa for sound financing of your requirements. NBT's friendly officers know the oil business, understand its many demands, and will give you the prompt, confidential service you need to help you see your plans through to completion.

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BARRETT* PROTECTIVE PRODUCTS
COVER EVERY PIPE-COATING NEED

1 **Pipeline Enamel**
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3 **A.A. Enamel**
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BARRETT* A.A. ENAMEL

The trade name Barrett* A. A. Enamel designates a plasticized enamel for protecting oil, natural gas, and refined product lines. It is not affected by exposure to the bitterest cold, or most torrid heat. It will not crack at —20° F., nor flow at 160° F. Because it withstands this wide range of temperature, it makes satisfactory pipe protective work possible at any season.

Like other Barrett* coal-tar enamels, Barrett A. A. Enamel is non-absorptive, non-porous, and retains its dielectric properties without regard to soil conditions. It forms a strong, flexible shield against corrosion, and also withstands stresses produced by pipe movements or backfill consolidation.

Above: Midwinter in Pennsylvania—Barrett A. A. Enamel will not crack at -20° F.
At right: Midsummer in the Arizona desert—Barrett A. A. Enamel will not flow, even at 160° F.

Memo: **FOR CORROSION ENGINEERS**

Barrett coal-tar materials for special uses are all dependable, durable and economical. Eternium* Paint for exposed metal work. CA-50 Heavy-Duty Cold Application Coating for concrete and metal exposed to extremely corrosive conditions. Marine Enamel for ships, barges and off-shore service vessels. Service Cement and Pipeline Fabric for field joints—no torching required. Asbestos Pipeline Felt for soil stress shield. Tank Bottom Compound for sour crude storage. 34 YB Paint for exposure to salt water spray conditions.

Barrett*

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

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WICKWIRE ROPE

A PRODUCT OF CF&I

Ask any user . . . you'll find them everywhere

In scores of industries, users of Wickwire Rope have developed an affectionate respect for its performance, safety and long life. And, for true economy, they use Wickwire's WISSCOLAY® Preformed. It lasts longer — is easier to cut, splice and install. It's kink-resistant and safer to handle. Wickwire Distributors and Rope Engineers, in key cities everywhere, are prepared to render prompt service in meeting your wire rope needs. Wickwire Rope Sales Office and Plant — Palmer, Mass.

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500 Fifth Ave., New York 18, N. Y.
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1080—19th Ave., Oakland 6, Cal.

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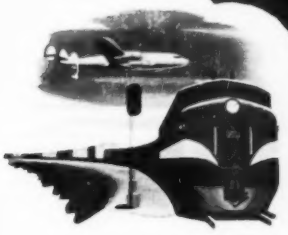

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MINING

PETROLEUM

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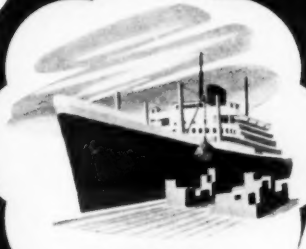
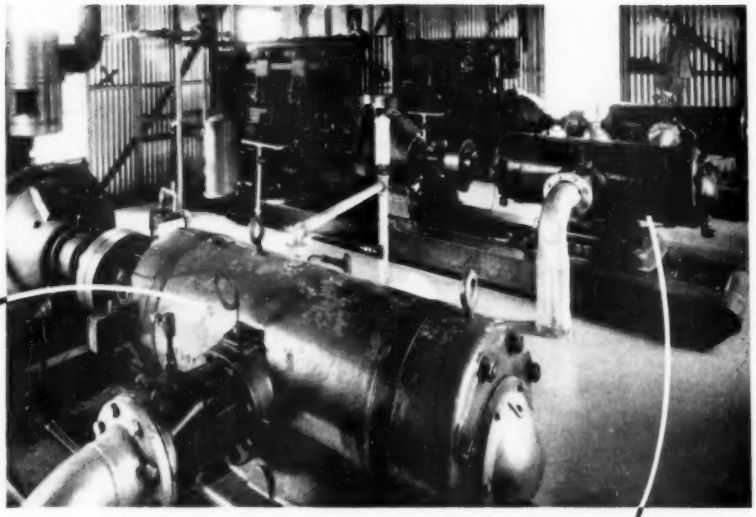


MARINE

CONSTRUCTION

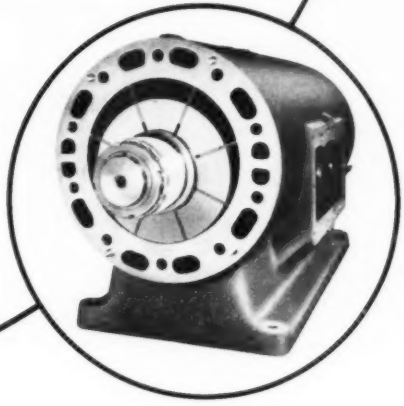
A. E. Bradshaw



Three Fuller Rotary Single-stage Natural-Gas Boosters, each machine boosting 1,430,000 cu.ft./24 hours, from 5-lb. gage to 25-lb. gage

JOHNNY ON THE SPOT . . . AND ALWAYS ON THE JOB

PRESSURES TO 125 psi.
CAPACITIES TO 3000 cfm.



Fuller Rotary Compressors are about the most faithful workers you can put on your payroll. You can spot them where you need them along your gathering lines . . . and always be sure they'll be on the job day after day, week after week.

Fuller Rotary Compressors are built to be dependable and economical in operation. They have but few moving parts . . . the rotor, bearings and blades. That means infrequent inspection, and minimum maintenance. Because blades automatically compensate for wear, full capacity is maintained for the life of the machine. Every detail in Fuller Compressors is engineered for one purpose . . . to give a life-time of new machine efficiency.

Fuller engineers will be glad to work with you for the proper application of Fuller Compressors to gathering lines or general booster requirements. You'll be taking a long step toward more economical, efficient operation if you call them in today . . . or write for Bulletin C-5, describing and illustrating in detail Fuller Rotary Compressors.

FULLER COMPANY
Catasauqua, Pa.

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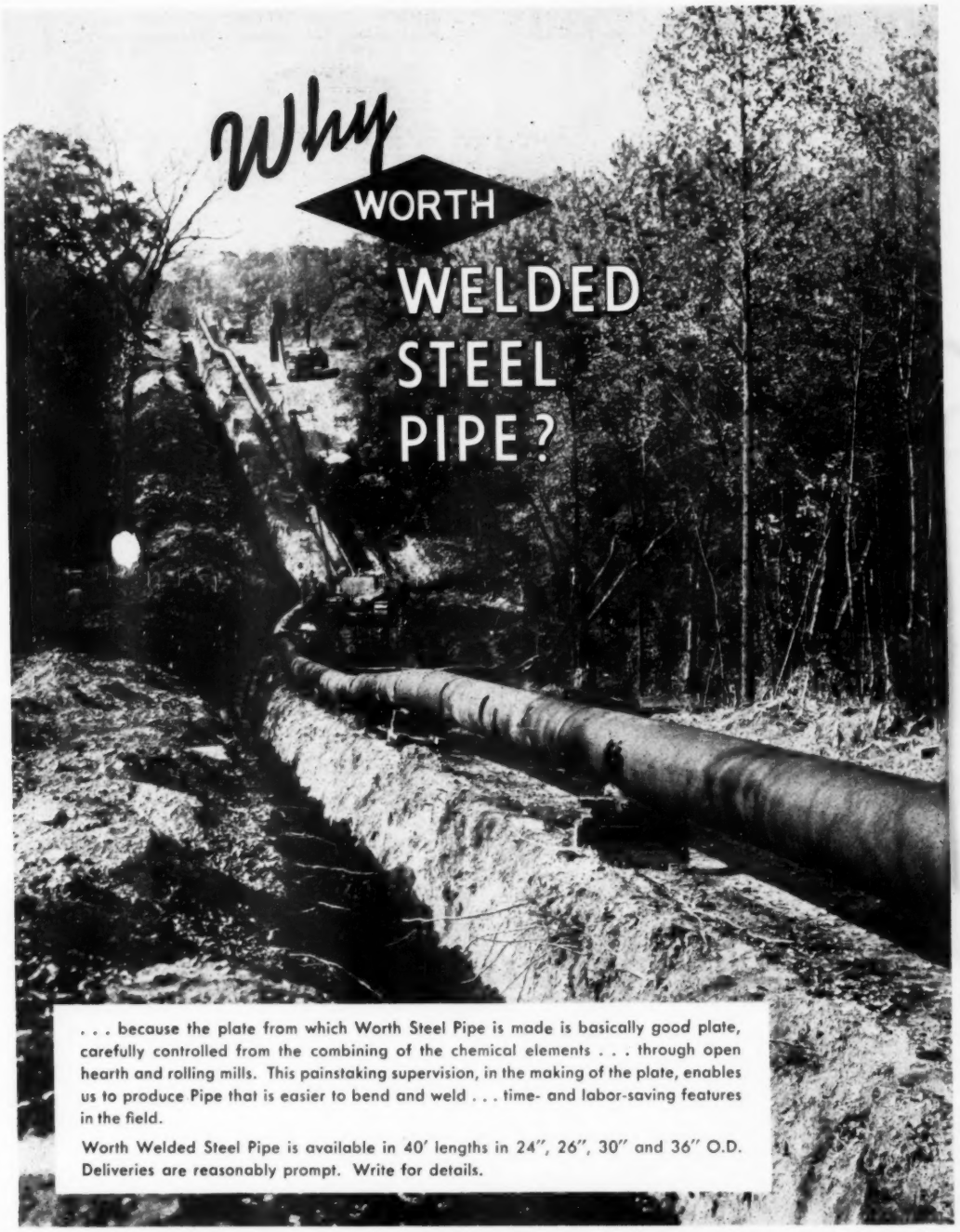
COMPRESSORS AND VACUUM PUMPS—
FEEDERS AND ASSOCIATED EQUIPMENT

fuller

C-202



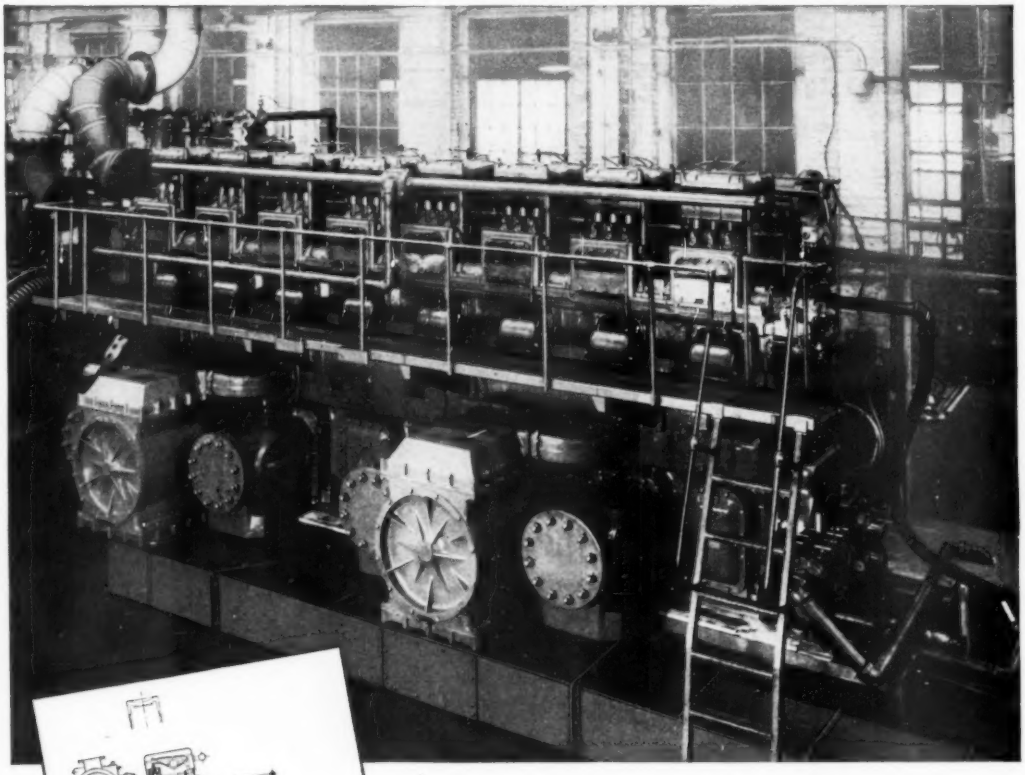
. . . because the plate from which Worth Steel Pipe is made is basically good plate, carefully controlled from the combining of the chemical elements . . . through open hearth and rolling mills. This painstaking supervision, in the making of the plate, enables us to produce Pipe that is easier to bend and weld . . . time- and labor-saving features in the field.

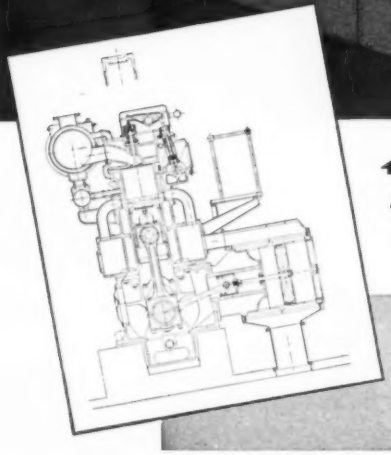
Worth Welded Steel Pipe is available in 40′ lengths in 24″, 26″, 30″ and 36″ O.D. Deliveries are reasonably prompt. Write for details.

FLANGED AND DISHED HEADS • CARBON AND STAINLESS-CLAD STEEL PLATES

WORTH STEEL COMPANY • Claymont, Delaware

BRAND





A unitio UTC-168 on the test block.

Section through engine and scavenging pump, showing 360° intake ports and the mechanical exhaust valves.

WORTHINGTON

NEW...

and 11 ways better!

Worthington Achieves a Triumph in Modern Angle Gas Engine Compressor Design with the Uniflo TYPE UTC-16's...Thru-Scavenging, 2-Cycle Engines of 800—2,000 HP that Hit New Highs in Efficiency AND Economy...Outstanding on Pipeline Duty

1. UNIFLO SCAVENGING — A RADICAL IMPROVEMENT OVER CONVENTIONAL LOOP SCAVENGING.

AIR PORTS AROUND ENTIRE CIRCUMFERENCE OF CYLINDER. Port area more than double.

EXHAUST THRU CAM OPERATED TIMED VALVES IN CYLINDER HEAD. Area 50% greater.

STRAIGHT LINE AIR FLOW thoroughly cleanses and cools entire cylinder.

SUPERCHARGING. Timed valves retain greater weight of pure air for perfect combustion.

THESE IMPROVEMENTS result in higher mean effective pressures without increased temperatures.

2. EN BLOC FRAME — permits use of removable cylinder liners.

3. DOUBLE AIR MANIFOLDS — doubles volume of air and steadiness of flow.

4. RENEWABLE CYLINDER LINERS — mean longer life and low-cost maintenance.

5. PISTON — completely symmetrical outer piston wall — wrist-pin supported in separate carrier.

6. CYLINDER HEAD — Worthington cone-type ... two large exhaust valves — streamlined passages.

7. GEAR DRIVEN CAMSHAFT — assures positive drive and perfect timing.

8. IMPROVED COOLING — jacket water space cast integral with liners, eliminating internal water seals.

9. LUBRICATING SYSTEM — Worthington cast-in manifolds, positive pressure lubrication to every running part.

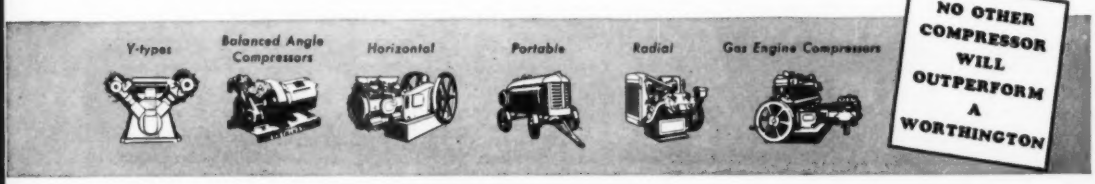
10. ACCESSIBILITY — inherent in straight-line engine design, increased by large access doors on both sides of the engine frame.

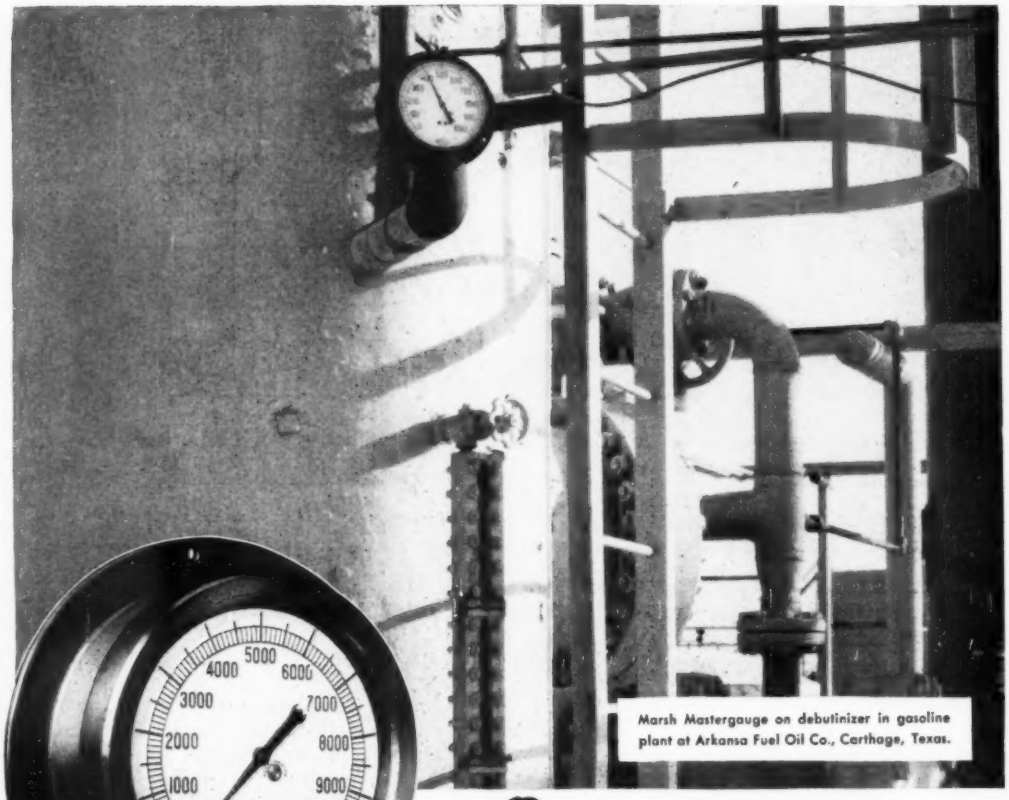
11. WORTHINGTON FEATHER* VALVES: lightest, tightest, quietest ever made used in both compressor and scavenging cylinders.

"CUSTOM-BUILT" FOR ITS JOB

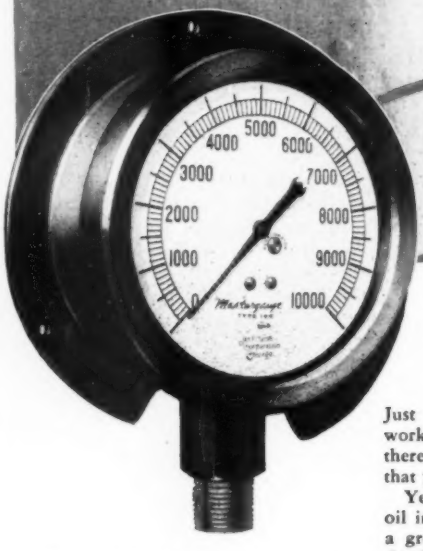
In addition to Worthington's experience covering half a century of building compressors for pipeline duty, more than seven years of intensive research devoted to developing the uniflo scavenging principles have gone into producing the TYPE UTC-16. The result is an Angle Gas Engine Compressor that meets the rigid requirements of gas pipeline service with more efficient use of fuel, cooler operation, improved accessibility and longer service life. For further facts about the uniflo TYPE UTC-16 — and proof that here, again, *there's more worth in WORTHINGTON* — contact your nearest Worthington Branch Office or the *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.*

*Reg. U. S. Pat. Off. EK-0.1





Marsh Mastergauge on debutinizer in gasoline plant at Arkansa Fuel Oil Co., Carthage, Texas.



The broad Marsh line includes gauges designed for blenders, boilers, burners, capping, Christmas trees, columns, heaters, hydrogen units, instrument panels, pumps, Reid vapor bombs, scrubbers, separators, mud pumps, stills, towers and other uses in all phases of the petroleum industry.

One GAUGE YOU CAN DEPEND ON

Just put a Marsh Mastergauge to work on a tough job and you'll find there is one rugged individualist that you can depend on — *always.*

Yes, the Jas. P. Marsh family of oil industry instruments comprises a group of better gauges ideally fitted to their jobs — the Mastergauge, Christmas Tree Gauge, Oil Country Boiler Gauge, Mud Pump Gauge, Hydraulic Gauge, and so on down the formidable list.

They were bred and reared for the oil country . . . designed and developed to go beyond all former gauges in meeting the challenge of oil field conditions — conditions often more arduous than in any other branch of industry. How well they have succeeded is attested by the unprecedented growth of Marsh sales wherever there is oil.

Ask your supply store for facts about Marsh Gauges, or write for your copy of oil industry bulletin.

MARSH INSTRUMENT COMPANY

Sales affiliate of Jas. P. Marsh Corporation • **DEPT. L, SKOKIE, ILLINOIS**

★ **THE MARSH BRANCH PLANT AT HOUSTON** offers shipment from stock and facilities for repairing all makes of gauges. It is located at 1121 Rothwell Street.

MARSH GAUGES

THIS MAN WOULDN'T NEGLECT

A MACHINE IN HIS PLANT

...yet he hasn't had a Chest X-Ray!

He checks every piece of mechanical equipment he owns for wear, lubrication, efficiency.

Yet he fails to take the simple precaution of a Chest X-Ray to make sure he does not have tuberculosis. *Not because he's opposed to the X-Ray. Simply because he is not sufficiently informed—or just hasn't taken the time and trouble, or does not realize the seriousness of the problem.*

A Chest X-Ray is the first step toward detecting tuberculosis in its early stages. And in its early stages it can be cured with the least loss of time from work.

So, if you're the man above, that one simple reason should make you get your Chest X-Ray—*today*. But listen, see how serious this really is:

Between the ages of 15 and 34, tuberculosis leads all other diseases as a cause of death—although at no age are you safe from TB. Yet, if everyone does his part by getting a Chest X-Ray periodically, and the majority of cases thus discovered are followed up, we can eliminate TB entirely as a public health hazard!

Will you do your part today? Get a Chest X-Ray. It may mean your life!

Published in the public interest by:

THE OIL AND GAS JOURNAL
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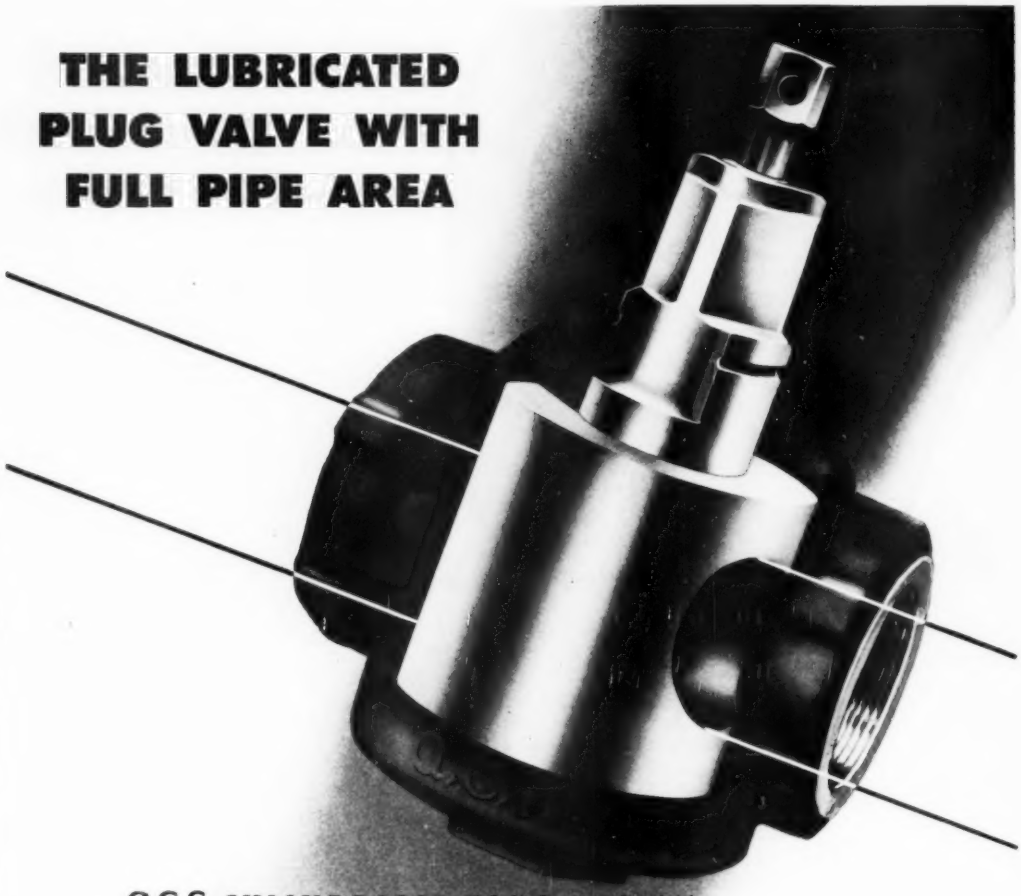
THE LUBRICATED PLUG VALVE WITH FULL PIPE AREA



a.c.f. CYLINDRICAL PLUG DESIGN

makes it possible. Straight-through openings result in smooth, non-turbulent flow, lowest head loss, reduced valve abrasion. Yet compact valve construction is retained in both rectangular and round-port types. Reason enough for a.c.f. Lubricated Plug Valve preference.

CYLINDRICAL a.c.f. FULL PIPE AREA LUBRICATED **PLUG VALVES**

Representatives in more than 50 principal cities

Write for Catalog 4-S1, describing types and sizes, to: American Car and Foundry Company, Valve Division, 30 Church Street, New York 8, N. Y.

AN Oil Bank
DIRECTED BY Oil Men
IN THE
Oil Capital of
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THE FIRST NATIONAL BANK
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50,000 Miles - No Wear!

1. 50,000 Miles in 10 Weeks! To test new Conoco Super Motor Oil, six brand-new cars roared over searing desert highways along the Mexican border. After 50,000 miles of continuous driving, engines *showed no wear of any consequence* . . . in fact, an average of less than one one-thousandth of an inch on crankshafts and cylinders!

2. New-Car Mileage! Gasoline mileage for the *last* 5,000 miles was as good as for the *first* 5,000 . . . actually there was an average difference for the fleet of only 4/100 of a mile per gallon! Proved: Conoco Super Motor Oil . . . with proper crankcase drains and regular care . . . can keep your new car *new!*

3. New-Car Power! Quicker Starts! Yes—Conoco Super Motor Oil's *extra protection* keeps that factory flash . . . that showroom smoothness . . . year after year! Conoco Super Motor Oil OIL-PLATES metal surfaces to make your engine last longer, perform better, use less gasoline and oil!

NEW CONOCO Super MOTOR OIL

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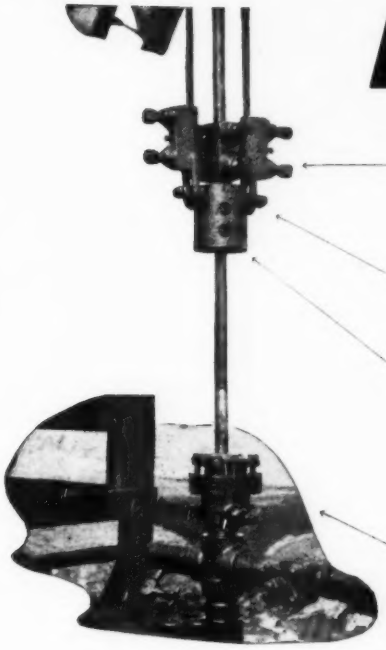
RATIGAN

EQUIPPED!



RATIGAN NO. 219 WIRE LINE CLAMP will take any size wire line from ¾" to 1¼" inclusive, and eliminates babbitting. It is designed for any trunnion type pumping equipment, such as carrier bars, or polish rod grips used in connection with horseheads or bridles on pumping wells. It is a perfect unit for use in combination with our No. 220 Shock Absorber.

RATIGAN NO. 204 POLISH ROD GRIP consists of three parts . . . the body, connecting block, and gate. It will accommodate all the carrier bars supplied by manufacturers of unitized pumping equipment. It has an approximate holding capacity of 53,000 lbs., yet weighs only 19 lbs.

RATIGAN NO. 220 SHOCK ABSORBER is new and especially designed for pumping units that are limited to width and headroom. It is a combination carrier bar and shock absorber, and used with horseheads that have 7" to 9" centers. It greatly reduces the breakage of sucker rods and polish rods, and is also very beneficial to the motors, engines and gears by cushioning the impact of the well on the reversal of the stroke. It also helps when the well is pounding fluid.

RATIGAN NO. 176 STUFFING BOX is a self-oiling unit receiving its lubrication directly from the pumping well. Its construction is such that polish rods are self-aligning . . . an important feature. Only high quality grade electric steel has been used, and the unit has been tested to 3,000 lbs. pressure.

This "Ratigan Equipped" well clearly shows how these products meet the urgent need for higher efficiency and safety in today's oil field operation. They are the finest in design, engineering and materials, and have been proved by many years of top performance under the most severe operating conditions. Specify Ratigan "Sure-Grip" Oil Well Pumping Equipment.

RATIGAN *"Sure-Grip"* PRODUCTS

OIL-LESS BEAM HANGERS AND ROD HANGERS
POLISH ROD GRIPS AND CLAMPS
SPRING SUCKER ROD HOOKS
SUCKER ROD ELEVATORS
SPRING SWIVEL LINKS AND "C" LINKS
OIL-LESS BEAM ROCKERS AND STIRRUP BEARINGS
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Stop VALVE SHOPPING!

for BRONZE — IRON — STEEL — CORROSION-RESISTING Valves

POWELL *makes them all*

Fig. 6061 — Class 600-pound Cast Steel Swing Check Valve. Flanged ends and bolted flanged cap.

When you want to buy a new suit, you don't shop for the coat in one place, the vest in another, and the trousers in still another.

But that's just what you do if you get your bronze or iron valves from one source, cast steel valves from another and possibly special design or alloy valves from several others.

No one makes better bronze, iron or steel valves than we do. And, in the field of special design and alloy valves for corrosion-resistance, Powell has always led the way. Today Powell makes the *only* COMPLETE line of these valves available.

In short, Powell makes all kinds of valves* needed in your industry—and makes them better. So stop shopping for valves. Standardize on Powell . . . and centralize responsibility for the efficient operation of the entire flow control system in your plant.

Fig. 6079 — Class 600-pound Cast Steel Gate Valve for Pipe Line Service. Has flanged ends and bolted flanged bonnet. Bevel gear operated. Also available in Classes 150, 300, and 400 pounds.

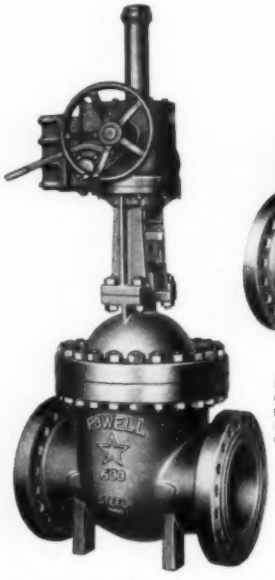
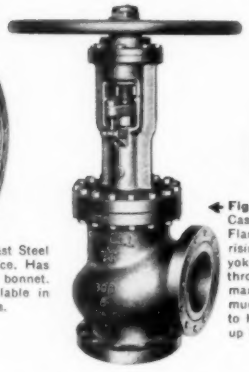


Fig. 6079 M.O. — Class 600-pound Cast Steel Gate Valve for Pipe Line Service. Has flanged ends and bolted flanged bonnet. Motor operated. Also available in Classes 150, 300, and 400 pounds.



← Fig. 3033 — Class 300-pound Cast Alloy Steel Angle Valve. Flanged ends, outside screw rising stem, bolted flanged yoke. Streamlined areas through the body assure maximum flow with minimum pressure drop. Built to handle temperatures up to 1400F.

Fig. 1375—200-pound Bronze Gate Valve with screwed ends, inside screw rising stem, union bonnet and renewable, wear-resisting "Powellium" nickel-bronze seat rings and disc.

Fig. 1793 — Large 125-pound Iron Body Bronze Mounted Gate Valve. Flanged ends, bolted flanged yoke, outside screw rising stem and tapered solid wedge. Also available in All Iron.

***The Complete Powell Line includes Globe, Angle, "Y", Gate, Check, Non-return, Relief, and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-resistant metals and alloys.**

Ask your nearest Distributor—or write direct

The Wm. Powell Co., Cincinnati 22, Ohio

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POWELL VALVES

This Simple Compressor Meets the Complex Needs of a Changing Petroleum Industry

It's the Nash!

Here is a compressor presenting advantages found in no other device. Nash Compressors have only one moving part, rotating without metallic contact with the pump casing. No internal lubrication is required. Yet they produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure.

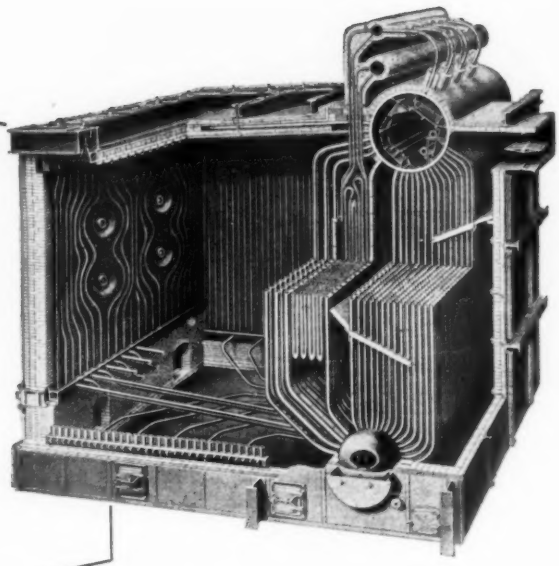
There are no valves, gears, pistons, sliding vanes, or other complicated wearing parts in a Nash. Compression is secured by an entirely different principle of operation. Because of this, gas pumping problems difficult with ordinary pumps are often easily handled by the Nash. For example, Nash Pumps are standard equipment in the Synthetic Rubber Industry, where they have met the needs of new and difficult processes.

Nash Compressors are compact and save space. They run without vibration, and compression is without pulsation. They maintain original performance over long periods. Service is assured by a nationwide net-work of Engineering Service offices. Instructive bulletin shows how they operate. Write for it.

- One moving part.
- No internal wearing parts.
- No valves, pistons, or sliding vanes.
- No internal lubrication.
- Low maintenance.
- Slugs of liquid entering pump do no harm.
- Non-pulsating pressure.
- Saves floor space.
- 75 pounds in a single stage.

NASH ENGINEERING COMPANY
273 WILSON, SO. NORWALK, CONN.

is a standardized Boiler Unit the Best Answer for your steam needs?



C-E Vertical-Unit Boiler, Type VU-50. This unit may be fired by oil, gas or any of the fuels commonly available to the oil industry. It may be equipped with economizers or air heaters as desired.

If your capacity requirements fall within the range of the Vertical-Unit Boiler (10,000 —350,000 lb of steam per hr), very likely the answer is YES! And this is true even though your combination of load, pressure, temperature, fuel and space conditions may pose a problem different from that of any other plant in the country. The reasons for the adaptability of Vertical-Unit Boilers to widely varying conditions may be simply stated:

FIRST — let's take load, pressure and temperature conditions. VU Units are in service — many for more than 10 years — operating at a variety of steam pressures up to 1,000 psi and at temperatures to 900 F and above. They are meeting load conditions that vary from the widely fluctuating demands of certain process industries to the above capacity requirements of overloaded steam plants.

NEXT — let's consider your fuel situation. The VU family is versatile. No matter what you burn — oil, gas, refinery waste or any other fuel — the VU furnace is adaptable to the most suitable type of firing equipment.

AND FINALLY — let's take a look at physical layout, i.e., space conditions. With the integral, water-cooled furnace in front of the boiler surface instead of below it, head room is seldom a problem. Since width, depth and distance between drum centers are variable in standard increments, virtually any space situation can be met. Or possibly your situation calls for an outdoor type unit, of which C-E has installed a great many, particularly for the oil industry.

As a matter of fact, the oil industry — world-wide — has purchased Vertical-Unit Boilers with an aggregate capacity of more than 12,000,000 lb of steam per hr. So you can select a VU Unit with confidence that you will get all the economic benefits of service-proved. standardized design in an installation suited to your particular conditions. B-331A

C-E

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A Merger of Combustion Engineering Co., Inc. and The Superheater Co.

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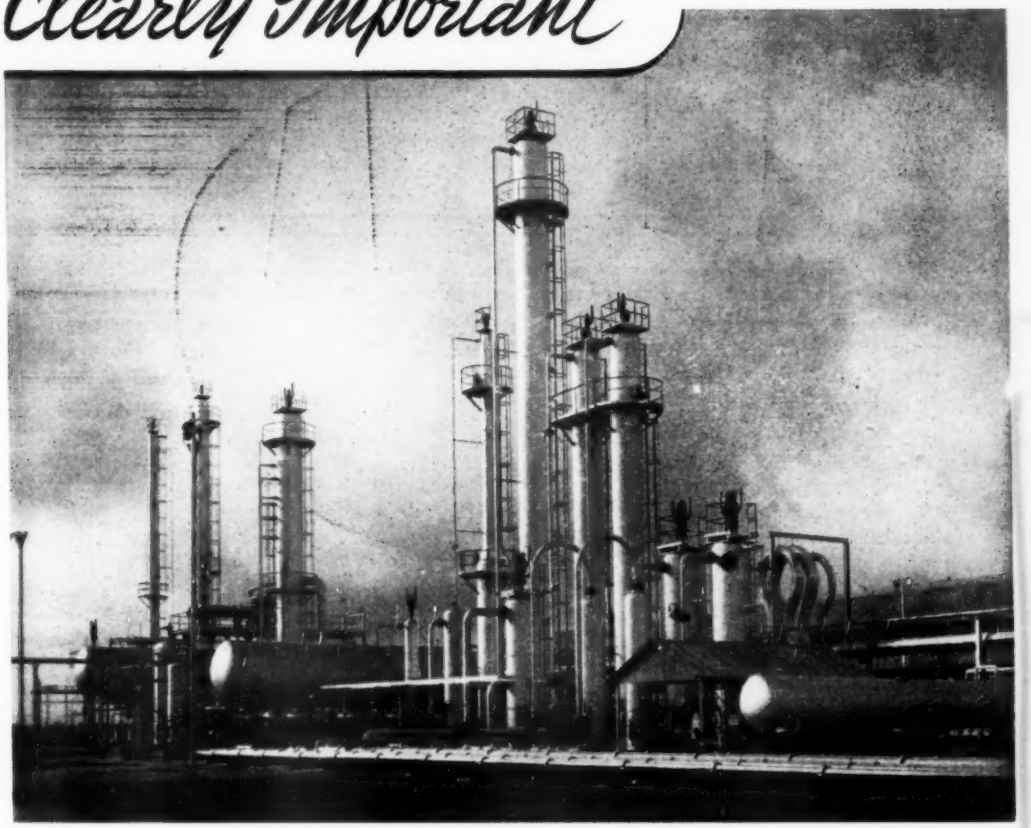

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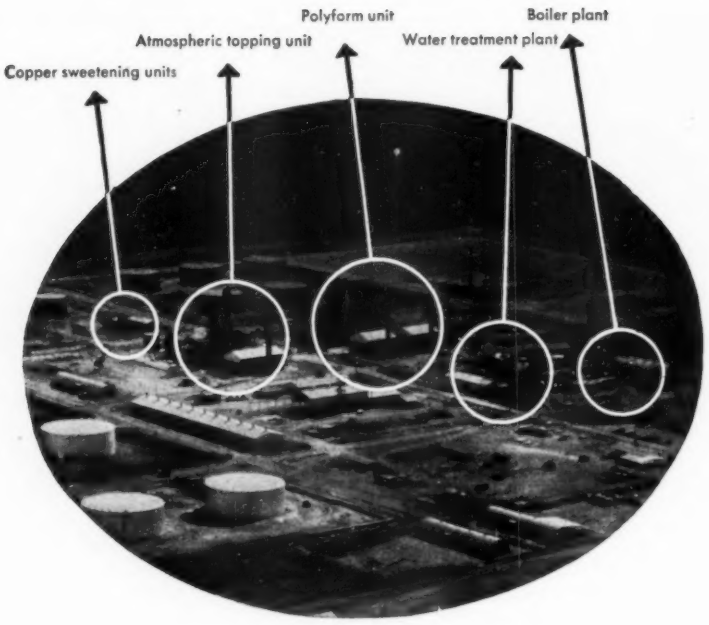
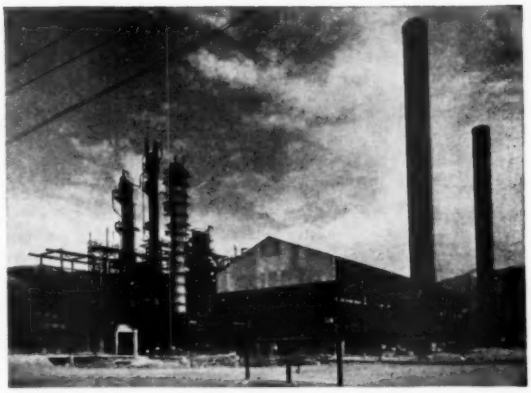


Lummus beats deadline at

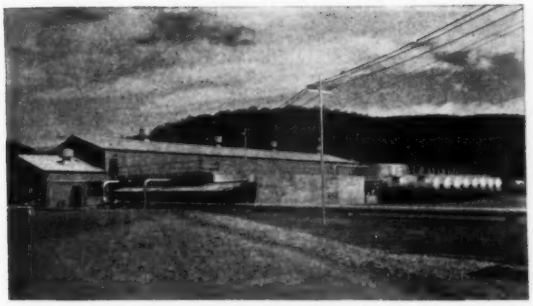
Currently going "on stream" is this completed and fully integrated 40,000 B/D Refinery. Clearing and grading at plant site was begun in February 1949. Once under way, the commitments of the planned work schedule were fulfilled before due date, with a significant time saving on the completed job.

The refinery is to produce motor fuel, diesel fuel, bunker C oil and liquid propane from E. Venezuela crude. Major units in the project, as shown on this page, include: (1) atmospheric topping unit and desalting unit, (2) naphtha-gas oil polyform unit of 32,000 B/D capacity, (3) two 10,000 B/D copper sweetening units, and complete water treatment and power supply facilities.

Completion of plants well in advance of schedule, reflects the thorough planning and sound construction experience which Lummus will bring to your next project —wherever it may be.



Naphtha-gas oil polyform unit. The gas oil is cracked once-through in the presence of propanes and butanes in a Lummus heater. Naphtha with propanes—butanes is cracked in the same furnace.



A complete water treatment plant of 3,500 GPM capacity is an essential part of the project. River water is filtered, chlorinated and treated for boilers, cooling and domestic use.

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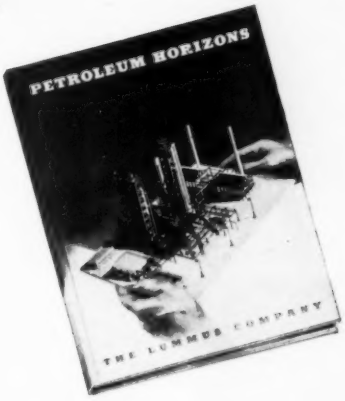
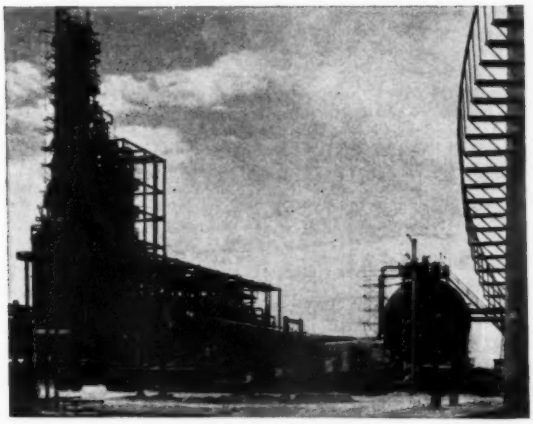
1950 Book of

Petroleum Processes



Puerto La Cruz

This new eighty page book describes the latest process developments in petroleum refining. Detailed descriptions and flow charts of more than thirty refinery processes are featured. Photographic techniques are employed to assist you to visualize units. Send for your copy—today.



Atmospheric topping unit, with 34-foot settling sphere of desalting unit at right. The gas recovery system consists of a compression recontacting operation followed by depropanization. The topping unit is equipped with a single down-draft Lummus furnace.

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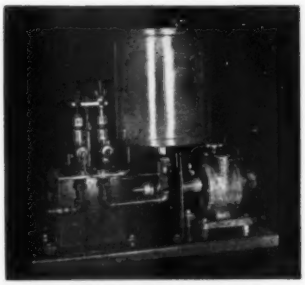
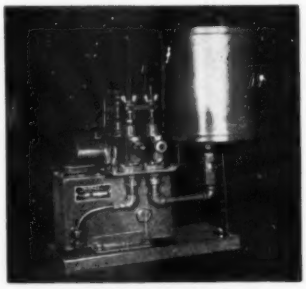
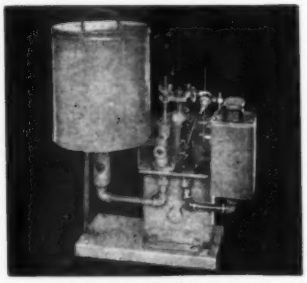


Self Lubricating Manzel Feeder with Rotary Drive Motor



Self Lubricating Manzel Feeder with Reciprocating Drive Motor



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These NEW Manzel Chemical Feeders have built-in force feed lubrication systems. These assure *complete* lubrication of the waste gas-driven motors, preventing the corrosion that frequently causes stoppage. They eliminate excessive manual labor formerly necessary in order to keep feeders constantly operating in wet gas fields.

The Feeders are available with Reciprocating or Rotary Drive Gas Motors, operating on as low as 3 lbs. pressure. They supply any desired amount of chemicals from 1/2 pint per hour up. Or you may obtain kits for conversion of present chemical feeders to force feed lubrication. Ask your Manzel Representative for details or write . . .

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They Say—

Dollar Shortage

Sir:

Because of the unstable condition in Taiwan, it is impossible to get a U. S. dollar check. I am sorry that I cannot continue my subscription to The Oil and Gas Journal. Surely, your magazine is very good and is a good friend of refinery employes. I will continue my subscription as soon as I get a chance.

Y. J. Hu,
Kaohsiung Oil Refinery,
Formosa.

Reader Hu represents one of the two groups which have had to drop United States publications since the war. One group is found in occupied countries (except Germany) where the currency can not be converted into dollars. The other is in countries where conversion may be made, but the rate is such (as in Brazil and Argentina) that purchase of goods with dollars is almost prohibitive.—Editor

To Secretary Snyder:

". . . I am not swayed by the argument that your folks propose only to take away part of the depletion per cent and leave about half. I know a man who was only half killed one time. That's the way the doctor estimated the damage. But he hasn't been able to do a lick of work since."

"Ellick Botts, consulting pumper," writing in Service, Cities Service Oil Co.

Not So in Pennsylvania!

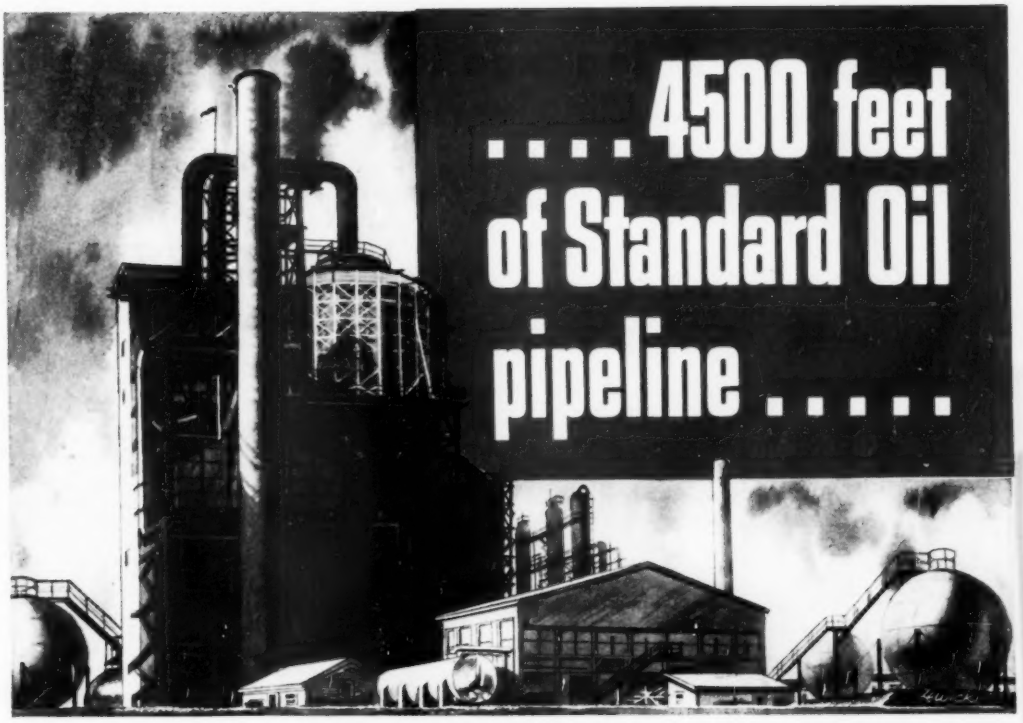
". . . Today's costs for replacing the barrels produced nationally are from three to five times greater than a decade ago, indicating that the industry must put back as replacement cost a greater sum than in the past. The industry generally is producing crude oil discovered when finding costs were much lower.

"Fortunately, Pennsylvania Grade producers are not experiencing the increased cost for finding crude oil prevailing with producers of other grades, since in the four states that yield Pennsylvania Grade the estimated recoverable reserves are sufficient to meet the refiners' present demand rate for more than a score of years.

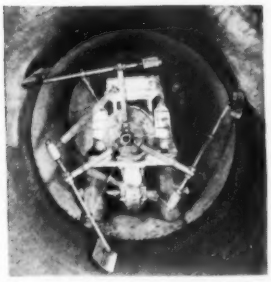
Annual report, South Penn Oil Co

Refining Profits

"The repetition of another warm winter after the abnormally warm winter of 1948-49 . . . further aggravated the refined-products price structure. It now seems apparent that



reconditioned by Centriline!



The Centriline process is a rapid and economical method of reconditioning pipe lines. It consists of first cleaning the main and then applying, by centrifugal force, a dense cement-mortar lining of required thickness, mechanically troweled to a smooth finish.

Not long ago tuberculation and corrosion had a strong hold on Standard Oil's 60″ salt water main running from Newark Bay to the plant at Bayway, New Jersey. As a result of this crippled and choked hydraulic efficiency, the plant was not getting the maximum amount of water needed for cooling purposes.

Through the Centriline method of first cleaning the main and then applying by centrifugal force a protective inner lining of 3/16″ cement mortar the original carrying capacity of this important pipeline was restored. Not only was there an increase in the amount of water delivered, but also depreciation and pumping costs were cut to a minimum.

Once tests show a decrease in carrying capacity and the budget shows costly pumping expenditures—it's time to Centriline. Wherever your pipeline is situated, whatever its length—if its diameter is 24″ or more—our men can quickly reach and recondition it.

We welcome your inquiry.

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For where hazards are involved, Sylphon Packless Valves guard you and your equipment against explosion, fire and other damage.

Sylphon Packless Valves do an outstanding job in preventing leaks because of their dual-ply, seamless metal Sylphon bellows. Replacing customary packing, the bellows stops even tiniest leaks that might seep past the stuffing box of an ordinary type valve. Re-packing is never needed—there isn't any!

Providing a positive seal, the bellows is metal-housed for protection against erosion. It seals the valve stem against corrosive, dangerous or inflammable liquids.

Sylphon Packless Valves make savings constantly when installed on pipe lines carrying oil, gasoline or other volatile liquids or vapors. Widely used in chemical plants, oil refineries, power plants, aboard ships. Available in many sizes and types. For complete information, write today for free Bulletin HO-813.

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Canadian Representatives, Darling Brothers, Montreal

unless the prices for refined products reverse the present downward trend, the (Republic Oil) refining company cannot be expected to reflect substantial earnings. In fact, if refinery operations can be carried out on a break-even basis on present prices, it is felt the utmost will have been achieved."

Annual report, Plymouth Oil Co.

No Atom Autos

"A leading automotive engineer has forecast that Americans will not be driving atomic energy-powered automobiles at anytime within the foreseeable future. Use of the atom in a private car would require about 25 tons of steel and concrete just to protect the passengers from radiation."

A.P.I. Newsnotes, American Petroleum Institute.

Only Freedom Needed

"The nation is not in any danger of oil shortage if the industry is given freedom from conditions that throttle its ability to produce. But the danger of such a shortage is real and acute if conditions shackling oil production are allowed to continue and the ability of the industry to do the job demanded by the public welfare and national security is allowed to be further impaired."

Editorial in the Fort Worth Star-Telegram.

What's Ahead

"The year 1950 promises to be a period of even more intense market competition. The growing availability of crude petroleum relative to demand may exercise an increasing pressure on crude prices. In the refined-products markets further moderate price declines may be anticipated . . ."

Annual report, Continental Oil Co.

Amuay Changeover

"The balance of the construction at Amuay (Venezuela) has been modified to fit changing market conditions, including a greater demand for asphalt and a decreased market for export gasoline and lubricating oils. Instead of the hydroformer and lubricating-oils plant previously projected, a vacuum stage and asphalt plant are being constructed. These are expected to be in operation during 1950."

Annual report, Creole Petroleum Corp.

Lessons From '49

". . . The events of 1949 have again reminded us that the oil industry is still not wholly predictable; that we can still have a shortage in one year and a surplus in the next; and that any company or country which freezes itself to any particular theory or policy as to the industry's future—

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RIGGING UP EQUIPMENT . . .
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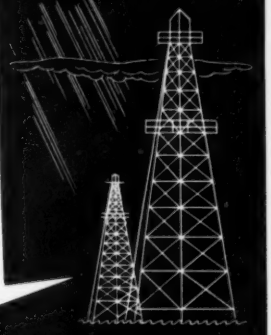

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No. 25-H-9.3
Hydraulic Jack

The jacks illustrated are hydraulically operated for use in low height areas. The 25-H-9.3 is $9\frac{3}{8}$" high with a lifting capacity of 25 tons. The 30-H-4.5 is only $4\frac{1}{2}$" high and will lift 30 tons. For more data on these and other time and effort saving jacks . . .

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Lo-Hite Hydraulic
Jack with
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ESTABLISHED 1883

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"The House that Jacks Built"

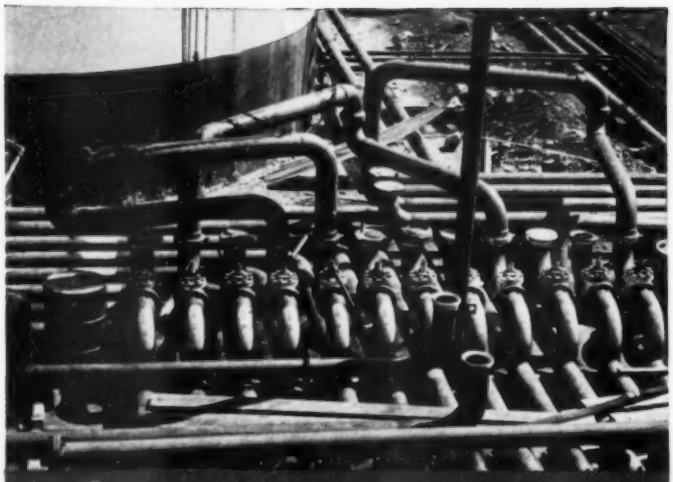

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FIG. 208

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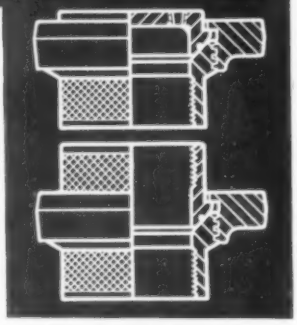

Ask your WECO representative or write for complete details and wide range of applications of WECO Fig. 208 Blanking Union.

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except the probability of change—is courting disaster, or at least disillusionment. Flexibility to permit meeting changed conditions will continue to be indispensable.

"The year 1949 has also served to reassure us with considerable emphasis that there is no probability of an early shortage of crude oil or its products in the United States or in the world. . . .

"Perhaps the most important old truth reaffirmed by the events of 1949 is the fact that there is a virile, militant competition in the oil industry and that our economic laws are still paying the highest rewards to the low-cost producer—the fellow who gets there first with the best products at the least cost; and conversely, that the high-cost producer continues to find himself involved in various kinds of trouble."

P. C. Spencer, president, writing in Sinclair Oil Corp.'s annual report.

Emerson and Ohio Standard

"Ralph Waldo Emerson once observed that 'Our chief want in life is somebody who will make us do what we *can*.'

"At Sohio we hold that bit of wisdom in high regard because we believe that our company has not been hampered, but rather has been stimulated and strengthened by *competition* in the oil industry, an unremitting battle that rages from the oil fields to the street corner service stations."

C. T. Foster, president, Standard Oil Co. (Ohio), in a radio address.

Refiners' Prices

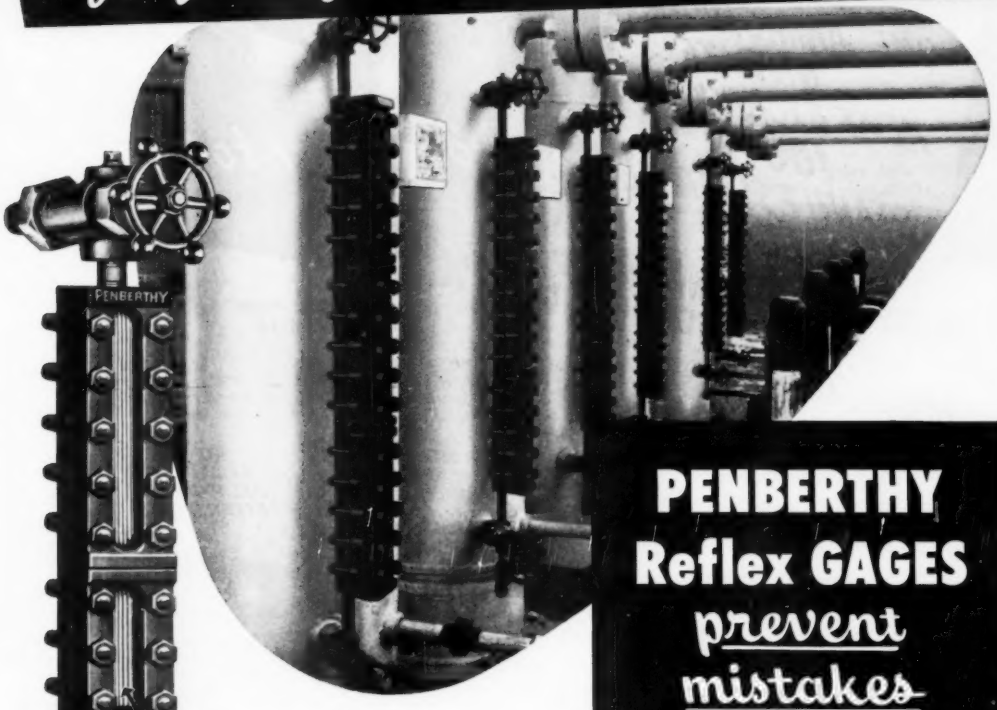
"The Kansas refiner when discussing product prices sadly points to the fate of refiners in neighboring states. Texas with 85 refineries, has 28 closed for lack of profits. Other states, including Oklahoma, have casualties. So far Kansas has none, but the refiner points out that an appreciably higher price for gasoline, and quickly, is imperative.

"The experienced marketer, looking back over the past, knows that an advancing refinery market has always strengthened the whole price structure, and surveying the wreckage of the retail markets left in the wake of the winter's damage, realizes that some marketers are going out of business too, if the retail market does not improve enough to leave everyone a modest living.

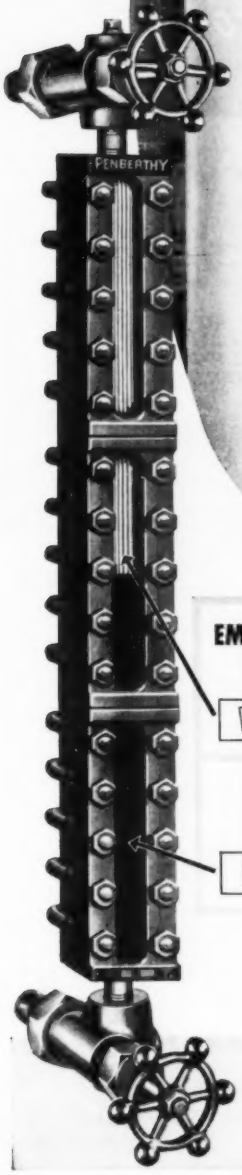
"He asks himself if the present unprofitable operation for the refiner continues where he will secure products for distribution in the future and he too finds himself realizing that an increase in the refiner's price is imperative to his own continued operation."

K.O.M.A. Bulletin, Kansas Oil Men's Association.

gages you CAN'T "MISREAD"



PENBERTHY Reflex GAGES prevent mistakes



There can be no doubt about the liquid level . . . no question whether the gage is empty or full . . . when a Penberthy Reflex Gage is used. The empty space always shows white and the liquid always shows black. It cannot be otherwise because of the unvarying natural law of the refraction of light. You can easily read the Penberthy Reflex Gage as far as you can tell the difference between black and white.

In addition to standard units, Penberthy Reflex Gages are also fabricated to customer's specifications from special alloys to meet unusual corrosive and temperature conditions. A complete line of flat glass transparent gages and tubular gages is also available. Penberthy Gages conform with API-ASME requirements. Ask for a copy of new Catalog No. 35.

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DETROIT 2, MICHIGAN
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Special Order By Telephone

ONE AMMONIUM NITRATE HEAT EXCHANGER 100% STAINLESS STEEL (ASI TYPE 347)

Only 3 days

From order to Shipment...

WESTERN does it in 13 BIG STEPS in 3 DAYS

FRIDAY, March 10

4:00 PM—Phillips Chemical Company, Bartlesville, places rush order by phone.

5:00 PM—ASI type 347 stainless steel ordered by phone from Metal Goods Corporation, St. Louis warehouse.

8:00 PM—Unit put on drafting board; rough draft finished and blueprinted by 11 p.m.

SATURDAY, March 11

8:00 AM—Draft personally carried to Bartlesville for approval.

12:00 NOON—Steel delivered to Frisco in St. Louis by Metal Goods.

3:00 PM—Finished drawing completed in Tulsa.

SUNDAY, March 12

8:00 AM—Materials received in Tulsa via Railway Express

9:00 AM—Begin machining phase.

4:00 PM—Finish machining all parts — 7 hours.

MONDAY, March 13

7:00 AM—Welding operations begin.

8:00 AM—Assembly work begins.

12:00 NOON—Assembly completed; unit tested hydrostatically and pneumatically.

3:00 PM—Finished Stainless Steel Exchanger shipped to Phillips Chemical, Etter, Texas.

MATERIAL FROM ST. LOUIS

APPROVAL FROM BARTLESVILLE

FABRICATION IN TULSA

DELIVERY TO ETTER, TEXAS

Making final check of specifications before shipment from Western shops

★ The same technical skilled attention to detail and streamlined production facilities which satisfactorily produced this rush-order on chemical process equipment is applied to all Western Heat Transfer equipment, whether in the chemical, petroleum or pipeline industries.

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JOURNALLY Speaking

Natural

THIS week's issue is a sort of special salute to the natural-gasoline industry, which is holding its annual convention in Fort Worth next week.

Instead of coming out with our "annual special" the week after the meeting and printing the papers presented there, our editorial brass hats decided to do something different this year. So they went out and got a very fine collection of special articles on natural gasoline.

This batch of features complements, rather than duplicates, the N.G.A.A. program. Of course we will have a full and prompt report on the convention, but this preconvention issue gives the "natural" men something down their alley to read on the way to the meeting. And those who stay home can bone up on the trends in their industry and maybe learn as much as if they had gone—but not have as much fun.

Added Attraction

WARNING! Make sure that you personally open the envelope containing next week's copy of the Journal if you want to be certain of getting the handsome wall map of West Texas oil which will be loosely inserted for quick removal. If you don't act fast your first look at it may be after it is securely fastened on the wall of an office down the hall. (Unless, our Circulation Department asks us to point out, you are one of those provident oil men who have personal subscriptions sent to their homes).

You've heard a lot of talk about Scurry County and will hear a lot more, and this map will enable you to follow this exciting play from your easy chair. But there is a lot of other activity in big West Texas, too, and this map is right up to date on everything.

But in your eagerness don't snatch the map and throw away the issue. It's a triple header. There's a whole special section of articles on West Texas oil and another special section about the simultaneous Chicago meetings of the three scientific societies of oil finders.

For some years now we have been saluting the rock hounds with an annual geological issue. The West Texas map and articles are an extra added attraction. It's not that the geologists and their brother scientists have done anything more unusual in West Texas than in other oil areas, but there is so much interest in the region and our editors had collected so much good dope on it that it seemed a good idea to run the whole works together.

Ten-Buck Book

ONE of the features in this issue is the Journal's annual survey and directory of natural-gasoline and cycling plants.

This is a companion to our annual survey of North American refineries, printed in our issue of March 23. The two shortly will be reprinted in a single booklet with which will be combined a list of the top management and technical personnel of every refinery and natural-gasoline plant in the country.

The personnel list is not printed in this issue, so there is no use looking for it. If you need such a list you will have to buy the entire booklet. It will cost you $10, but it is an invaluable reference work for everybody having any dealings with this branch of the oil industry. Our Reader Service Department is now taking orders.

Tax Tokens

A BILL before Congress proposes the issuance of 2½-cent and 7½-cent coins. If issued, we suggest that their use be made compulsory in buying gasoline. If the motorist had to shell out one coin for Uncle Sam and another for the state tax collector every time he bought a gallon he would realize how little of the price goes to the oil industry.

—Henry D. Ralph

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The OIL AND GAS JOURNAL

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In This Issue

News

FPC Faces First Real Test of Jurisdiction Over Independent Producer 133
Chances of Kerr Gas Bill Passing on Veto Override Appear Dim 134
RFC Oil Loan Draws Opposition Before Senate Investigating Committee 136
Imports Issue Tops Discussions at Rocky Mountain A.P.I. Meeting 137
South Ceres Pool of Oklahoma Now More Than 7½ Miles Long 138
Small, Revolutionary Gas Turbine Developed by Boeing Airplane Co. 139
Texas Natural-Gas-Liquids Industry in Difficult Position 140
Army Makes Public Reasons for Oil-Specification Changes 141
Natural Gas and Its Products Gaining in Importance, Course Hears 143
Engineering Data Indicate Kelly, North Snyder Pools Are One Reservoir 143
Texas Boosts May Allowable 58,241 Bbl. Daily Over April 144
Operators Running Into Trouble in Egyptian Oil Exploration 145
Contracts Let for Canadian Refinery Expansion 145
ECA Predicts Marshall-Plan Countries to Increase Oil Consumption 147

Natural-Gasoline Section

Gasoline Industry's Leaders Appraise Its Problems 152
Processing Methods to Obtain 85 Per Cent Propane Recovery 157
Economy Principal Factor in Design of Today's Processing Plant 158
Rich-Oil Rectification Achieves Flexibility and Efficiency 159
Highlights in Modern Compressor-Plant Design Trends 160
Hypersorption Provides Selective Separation 163
Portable Catalytic Reforming Unit for Field Processing 163
Application of Refrigeration Methods in Obtaining Higher Yields 166
Field Processing Plants Recently Completed 169
Improved Propane Extraction from Rich-Oil Stabilization 169
New Safe, Practical Storage and Transportation Methods 170
New Sun Plant Serves Five Southwest Texas Oil Fields 174
Platforming of Natural Gasoline 177
La Gloria Plant Gets Three Major Additions in 9 Years 180
Plant Production of L.P.G. Soars Above That of Gasoline 185
Stanolind Starts Operation of Three New Plants 188
Projects Now Considered Will Greatly Up Input Gas Capacity 205
More Wells, More Oil? Some Examples of In-Filling Drilling 208
Survey of Natural-Gasoline Plants 223
Survey of Cycling Plants 233
Loading Racks Designed for Safety and Utility 234
Chalk Hill Plant Illustrates Manufacture-Repressure Design 240
Unitized Shale Shaker Saves Rig-Up Time 242
Selection, Operation, and Maintenance of Cooling Equipment 243
Richfield Uses Unitized Manifolds for Hydraulic Pumping 247

Engineering-Operating

Questions on Technology 248
Refiner's Notebook—Economics of Automatic Control 259
Engineering Fundamentals—Coring and Sampling 261
Other Engineering and Operating Articles in Natural-Gasoline Section 151

Exploration-Development

Why Independents Find Some Fields 283
Highlights of Week's Developments 283
Reports by Areas Start on Page 284

Departments

They Say 120
Journally Speaking 127
Editorial 131
This Week 132
Watching Washington 135
International News 145
Personals 148
Deaths in the Industry 150
Pipe-Line News 263
Pipe-Line Construction 267
Drilling Contractors 273
Refining News 277
Natural-Gas News 281
Natural-Gasoline News 281
Exploration Statistics 298
Production Statistics 299
Refining Statistics 300
Market Statistics 301
Equipment Men in News 302
Classified Advertising 305
Calendar of Events 309
Advertisers' Index 310

EDITORIAL

BAKER CASING SCRAPING WILL SAVE YOU MONEY, AND TIME, AND TROUBLE

There now are two types of Baker Casing Scrapers which safely, efficiently and economically remove bullets, burrs, hardened cement or mud, and even mill scale from the important "working surface"—the inside wall of the casing.

The results are so satisfactory that many operators now consider the use of a Baker Casing Scraper a "must" in well completion, or after every gun-perforating job.

CHOOSE THE TYPE TO EXACTLY MEET YOUR NEEDS

While the rotary rig still is up, and only hardened cement or a limited number of gun-shot burrs are to be removed, the time-tested Baker MODEL "B" Casing Scraper (Product No. 620-B) is recommended. It is usually run just above the bit while drilling out cement, and will completely remove protruding burrs as well as the thin sheath of cement left even after the maximum gauge bit has been used for drilling out.

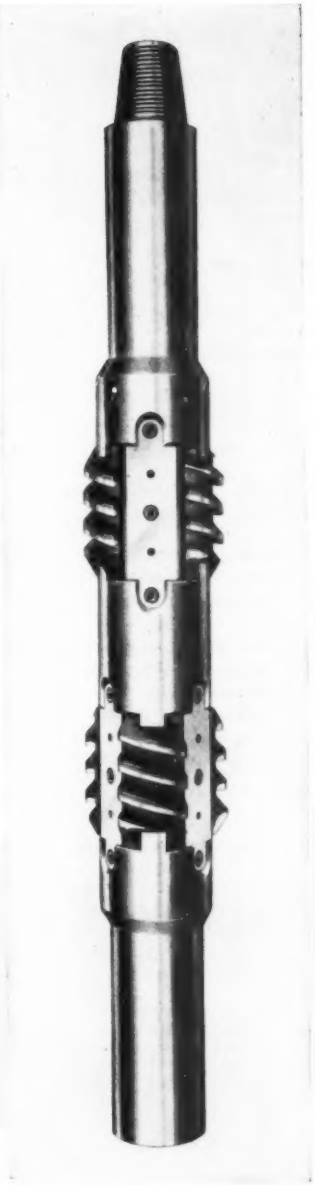
When there are several hundred gun-shot holes (with possible imbedded bullets); or if the hardened mud sheath is to be removed from top to bottom of the well, the new Baker ROTO-VERT Casing Scraper (Product No. 620-C) is recommended. The ROTO-VERT can be run on drill pipe for successful vertical scraping of obstructions as it is being lowered in the hole; followed by rotation if difficult well conditions make rotation necessary or desirable. Or it is run on tubing or a wire line for successful all-vertical scraping.

Either method leaves the inside wall of the casing "clean as a hound's tooth" safe for testing and completion, and ready also for all future down-hole work a year or ten years in the future.

NEW ROTO-VERT IS SAFE AND POSITIVE

The strong, simple construction of this efficient scraper is evident from the illustration which shows the rugged body on which six blade blocks are mounted, and held in position by blade block retainers. The blade blocks are set in two horizontal rows in a staggered position so that the blades overlap and will scrape the full 360° inside wall surface of the casing. The shearing edges are cut on a helix angle and provide a scraping, or shearing, action both while moving down the hole and while rotating. The thrust of each blade block, when rotating, is taken by a driving block which is welded to the body. Springs behind each blade block hold the heavily hard-faced cutting edges against the inner wall of the casing where they exert positive shearing action. ROTO-VERT blades will never screw down past a casing burr because their scraping edges follow the contour of a LEFT-HAND SCREW.

Contact the Baker representative in your area and find out how the reasonable rental is mighty cheap insurance for having *every* well in perfect condition for running tubing or liners, as well as any type of swab, tester, packer or cementing device.



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The Conservation Division

This number of the Journal features the activities of what rather aptly has been termed the "conservation division" of the oil and gas industry.

Commonly referred to as natural-gasoline manufacture, the division today includes cycling and several associated operations extending from the producing formations to the various uses by millions of customers.

The liquid output of more than 500 plants scattered throughout the oil and gas fields was 486,000 bbl. daily, according to the latest government report. This amounted to 9 per cent of the domestic output of liquid petroleum.

Actually the significance of these lighter-hydrocarbon operations far exceeds the average volume relationship of 9 to 10 per cent.

The wet gas from which the liquids are extracted makes possible the economical recovery of crude oil in both primary and secondary operations. The residue gas from the plants accounts for a substantial part of the rapidly increasing domestic consumption of natural gas. Except for a few per cent this division is the sole source of supply for millions of consumers of liquefied petroleum gases.

Obviously all this adds up to the conclusion that the production, transportation, and distribution of these hydrocarbons should now be rated as a major enterprise, not only of the oil business, but of our entire economic system. The value of the products in 1948 at the plants approached a half-billion dollars, only slightly below the value of all the crude oil produced in this country in 1931.

Conservationwise the 9 per cent becomes 100 per cent. During the first 50 years of the oil industry's history there was no attempt to recover these light liquid products, and the gas from which they are now obtained was usually wasted. The remarkable growth of more than 100 per cent during the past 10 years largely stems from a general acceptance of the conservation principles involved in the production and processing operations.

This rapidly expanding division has problems—some new, some recurrent. Unfortunately many developments which mean progress for the remainder of the oil and gas industry present difficulties for the owners of natural-gasoline and cycling plants.

The expansion of cracking constantly adds to refinery production of these lighter hydrocarbons, supplying direct competition and also reducing the natural gasoline needed for blending finished motor fuels. The shift from motor to the research method in octane testing penalized natural gasoline and related products.

These and other economic and technical developments are discussed in a symposium by manufacturers, designers, and builders in this issue.

It is apparent that adequate answers to all problems are available within the existing framework of today's oil and gas operations. Conservation as well as self interest demand that there be no delay in their application.

THIS WEEK

VETO—Death of Kerr natural-gas bill may be interpreted by FPC as go sign to regulate field prices of gas sold to pipe lines. . . . Truman's veto message left a small loophole for possible new attempt to limit regulation of producers, but no such legislation is likely soon. . . . Immediate test of FPC's assumed powers will be made against Phillips Petroleum Co. in attempt to reduce gas prices in western Kansas, Oklahoma, and Texas. . . . Producing states will fight invasion of their regulatory powers. . . .

NATURAL GASOLINE—Rapid construction of new plants brings problems of overproduction to natural-gasoline industry. . . . Added to weakening market is now concern over proposals before Texas commission to prorate output. . . . Special series of articles on light-hydrocarbon industry points up current technical and economic developments. . . .

INDUSTRY AFFAIRS—Brantly disturbs Rocky Mountain producers by advocating heavier imports of foreign oil. . . . Refiners sharply divided over wisdom of commercial adoption of military specifications for heavy-duty lubricating oil. . . . RFC loan commitment to Texmass Petroleum Co., first federal venture in oil financing, under heavy fire from Congress. . . . Phillips Petroleum Co. increasing its ownership percentage in American Independent. . . .

STUDIES—Preliminary studies with airplane-type gas turbine suggest adaptation to gas pipe lines, other oil-industry uses. . . . Scurry County findings to date fail to give full information on Canyon reef. . . . Whether one big field or separate pools still in doubt. . . . Curious Ceres pool in Oklahoma appears to be snake-like formation 7½ miles long and one well wide. . . .

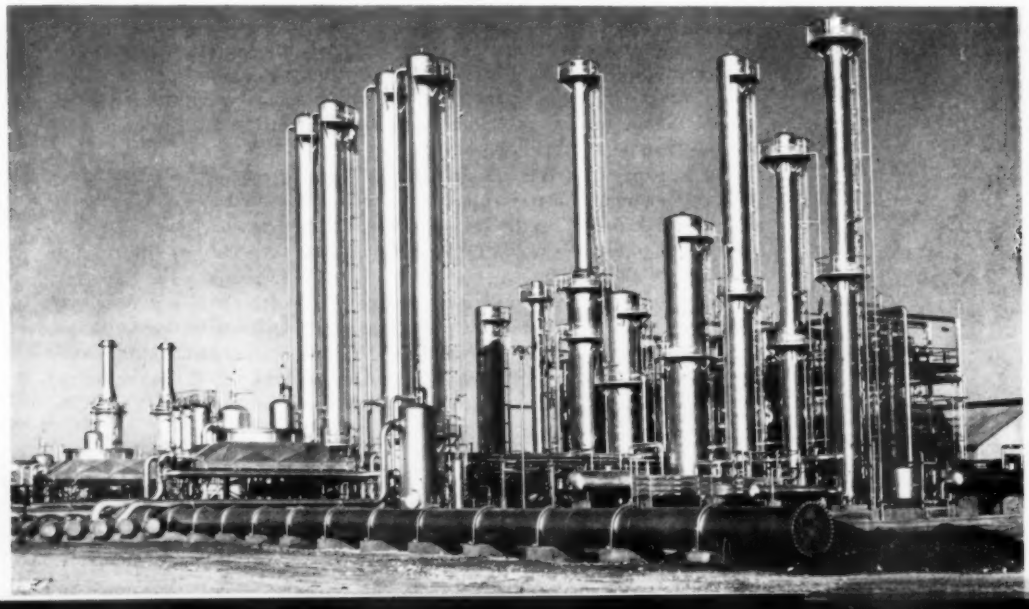
TRENDS—Most of the 3,721,000 bbl. reduction in domestic crude stocks, reported by the Bureau of Mines for week ended April 8, should be credited to March. . . . Demand for domestic crude for 5 weeks ended April 1 exceeded production by about 6,000,000 bbl. . . . Reported stock reduction was only 1,517,000 bbl. . . . Actual crude stocks probably increased about 1,000,000 bbl. for week ended April 8. . . . Texas allowables for May increased 58,241 bbl. daily. . . . Lube-type crudes given big increase. . . .

ACTIVITY—Crude production for week ended April 15 averaged 4,922,190 bbl. daily, a decrease of 10,235 bbl. daily from previous week. . . . Well completions totaled 742 for the week, a gain of 24 wells. . . . Wildcat completions were off 3 wells to 133. . . . Rotary rigs operating in United States on April 10 totaled 2,037, an increase of 29 rigs for the week. . . .

INTERNATIONAL—Jersey Standard pulls out of Egypt because of law hampering foreign capital. . . . Shell and Socony-Vacuum, only remaining operators, still dickering but see little hope. . . . Egyptian oil development may halt. . . . ECA forecast of European petroleum requirements sees increase in oil consumption by Marshall plan countries but decrease in dollar purchases. . . . New refinery for Regina brings to four the refineries to be completed in Canada's prairie provinces during 1950-51.

PIPE LINES—Construction to get under way soon on Interprovincial Pipe Line Co. line from Alberta to Great Lakes. . . . Pipe is already strung on one 150-mile section. . . . Condor S.p.A. (Shell) reported planning construction of 80-mile crude line in Italy. . . . Transcontinental Gas Pipe Line Co. survey for microwave installations to be made this month. . . .

"NATURAL" GROWTH.—The huge and intricate fractionating towers and other equipment of this natural-gasoline plant, typical of many which have been built in recent years, dramatizes how the industry has grown since the first plant at Sistersville, W. Va., in 1908, which had a rated capacity of "six iron barrels" per day. Further proof of the present stature of the natural-gasoline industry may be found in the series of special articles starting on page 151 of this issue.



Test of Power

Investigation of Phillips' natural-gas operations looks like first real legal test of FPC authority under old law

Henry D. Ralph

THE first real test of the Federal Power Commission's jurisdiction over an independent producer selling natural gas to an interstate pipe line now that the Kerr bill has been vetoed, will open in Bartlesville May 1 when the commission begins hearings in its investigation of Phillips Petroleum Co.

The investigation is to determine whether or not Phillips is "a natural-gas company" within the meaning of the Natural Gas Act, and therefore subject to FPC regulation.

Specifically at issue are the rates charged by Phillips for gas produced and gathered in the Hugoton and other areas of western Kansas, Oklahoma, and Texas, and resold to Michigan-Wisconsin Pipe Line Co. for interstate transmission. The notice of hearing also indicates that the commission will investigate pipe-line sales of gas by Phillips in other areas.

The Phillips case may turn out to be of great importance to the entire oil and gas industry. Phillips is primarily an oil company but is a large seller of natural gas, much of it produced in connection with oil. Its operations probably are typical of many other companies. If Phillips is brought under FPC control, so may many other oil companies producing and gathering natural gas which eventually goes into an interstate pipe line.

Had the Kerr bill become law, the commission's case against Phillips might not have stood up long. The declared purpose of the bill was to exempt from federal regulation all arm's-length sales of natural gas by producers and gatherers not themselves engaged in interstate transmission. If the bill had not been vetoed the Phillips investigation might have provided a court test of the scope of its language.

What's at stake.—As it is, the Phillips case appears likely to provide a legal test of the commission's powers under the old law.

These powers have been a matter of debate and uncertainty for several years, particularly since the inconclusive decision of the Supreme Court in the case of Interstate Natural Gas Co. in 1947.

Most of the time since then Congress has had before it various bills to clarify this point. In all the hearings and debate on these bills there has been no agreement as to whether or not the Federal Power Commission has any jurisdiction over such activities as are involved in the pending Phillips case.

Some argued that FPC had no jurisdiction even without enactment of the Kerr or similar amendments. Others contended that the original intent of the Natural Gas Act was in imminent danger of being enlarged by court interpretation and that amendment was necessary to prevent the commission from exercising control over gas producers where none had been expressly granted by Congress.

The five commissioners themselves were divided on the issue, usually by a balance of three-to-two, one way or the other. At one time (August 15, 1947), a majority of the commission signed Order No. 139 asserting that, for the time being at least, FPC would not exert jurisdiction over sales of independent producers. This order is still in effect but it has no standing in law and could easily be revoked. There have been several changes in the commission's membership since it was issued.

In his veto message President Truman apparently sided with those who believe the present statute gives FPC power to regulate pipe-line sales by independent producers and to fix their rates. At least the tone of his message indicated that he felt that the Kerr bill would subtract from the commission's present authority.

It may be expected, therefore, that the present members of the commission will proceed on this assumption and will seek an early court test of the law as applied to independent producers.

And the pending case against Phillips Petroleum Co. would seem to be ready-made for such a test.

The order instituting an investigation of Phillips' gas activities was issued by the FPC October 28, 1948, but until this spring nothing was done about it other than field investigations by the commission's staff. Last February the commission set the case for hearing and issued some preliminary findings and an order specifying the issues.

How it started.—The Phillips investigation grew out of a complaint by the city of Detroit, which is served with gas by Michigan-Wisconsin Pipe Line Co. At the time this line was begun (1945), Phillips contracted to supply up to 343,000,000 cu. ft. of gas daily—the line's entire requirements—at an initial price of 5 cents per M.c.f., subject to an escalator clause. Much of this gas is purchased by Phillips from other producers but is gathered and delivered to Michigan-Wisconsin by Phillips.

Since then Phillips has raised prices under its original contract and has entered supplemental contracts with Michigan-Wisconsin to supply additional gas at higher prices. The city of Detroit says that the average price is now approximately 8½ cents per M.c.f. The Public Service Commission of Wisconsin, which has intervened in the case, says that the price of gas is now approximately 100 per cent over the original agreement.

The FPC announced that its investigation will determine whether Phillips' gas operations and contracts make the company subject to regulation, and whether the prices charged Michigan-Wisconsin are unjust, unreasonable, or discriminatory.

What to expect.—That other gas activities of Phillips may be involved in the hearing is indicated by the commission's preliminary finding that Phillips produces gas in Texas, Louisiana, Oklahoma, and New Mexico and sells it to 11 named pipe-line companies, all of which are subject to FPC control. In 1948, the commission said, Phillips sold 149,172,902 M.c.f. for interstate transmission and received $5,350,064 from this business.

Phillips has filed no answer to date, but there are indications that it will put up a strong fight when the hearings open. Should the commission succeed in establishing its jurisdiction it could fix the prices at which Phillips sells all gas to pipe-line companies. Prices might be fixed on the public-utility basis of cost of discovery rather than general field prices. Victory in the Phillips case doubtless would lead the commission to similar action against other gas producers.

States intervene.—The importance of this case is further emphasized by the fact that the states of Oklahoma, Kansas, and New Mexico have intervened and become parties to the proceeding on the ground that the Federal Power Commission threatens to interfere with their sovereign powers to control the development of natural resources.

The Kansas Corporation Commission said:

"This commission is opposed to the theory that every person, firm, or partnership engaged in the production, gathering, or sale of natural gas is a natural-gas company as defined in the Natural Gas Act, and asserts that it believes this proceeding is an

attempt to exercise jurisdiction not conferred nor contemplated by the Natural Gas Act, and is an unwarranted and unauthorized interference by the Federal Power Commission with the legitimate and earnest efforts of this commission to achieve complete fulfillment of the purpose and intent of the laws with respect to production and conservation of natural gas."

Much the same position was taken by the Corporation Commission of Oklahoma, which also pointed out that some of the Phillips gas involved in the case comes from the Guymon-Hugoton field which is being produced under proration orders of the state commission. It particularly cited its own orders, which have been upheld by the Supreme Court of Oklahoma, establishing a minimum field price of 7 cents per M.c.f. for gas sold by Phillips and others from this field.

Regulation by the Federal Power Commission of prices to be received by Phillips for sale of Hugoton gas, the state commission said, "would constitute a substantial interference with the exercise of the power of the State of Oklahoma through this Corporation Commission to reguate the production and gathering of gas.

"Such regulation," it continued, "would directly interfere with the power and exercise by the state to fix and determine prices at which gas can be produced from wells located within the state for the purpose of preventing economic and physical waste of natural gas and protecting the correlative property rights of all persons interested in the common source of supply.

"The fixing of the prices to be received by Phillips Petroleum Co. from such sales to Michigan-Wisconsin and Panhandle Eastern pipe-line companies would be wholly inconsistent with and constitute a substantial interference with power and its exercise by the state to promulgate rules, orders, and regulations relating to the production and gathering of natural gas."

In this position the Oklahoma commission relied heavily on language in the Supreme Court opinion in the Interstate case which said:

"Where sales, though technically consumated in interstate commerce, are made during the course of production and gathering and are so closely connected with the local incidents of that process as to render rate regulation by the Federal Power Commission inconsistent or a substantial interference with the exercise by the state of its regulatory functions, the jurisdiction of the Federal Power Commission does not attach."

Sale announced.—It has just come to light that, perhaps to clarify its legal status before the FPC, Phillips recently sold all the stock of Independent Natural Gas Co., formerly a wholly owned subsidiary.

Independent is a small company operating in Gray County, Texas, and was classified as a natural-gas company under the law and had obtained a certificate from the Federal Power Commission to do interstate business. According to its 1948 report to FPC, this company owned 65 miles of pipe line and two transmission stations, had total assets of $1,562,575, and handled 18,000,000 M.c.f. of gas this year. It connects with the interstate line of Northern Natural Gas Co. in Carson County, Texas. The stock was purchased by E. L. Green, Jr., and Hugh Burdette, of Pampa, Tex., who are officials of Cabot Carbon Co. but who made the purchase as individuals.

The vetoed Kerr bill exempted sales by "a producer or gatherer not otherwise engaged in and not controlled by or controlling" a company engaged in interstate transportation. Continued ownership of Independent might have given FPC an excuse to regulate all of Phillips' gas sales, even had the Kerr bill become law. Whether or not this divorcement will affect Phillips' status under the old law doubtless will be one of the issues at the forthcoming hearings.

Gas-Bill Veto

Overriding of President's action considered impossible; Connally, Kerr issue sharp statements criticizing veto

Bertram F. Linz

WASHINGTON.—The close vote by which the Kerr bill scraped through the Senate and House was seen this week as precluding any effort to override President Truman's veto of the measure.

Final passage of the legislation was secured by only six votes in the Senate and two in the House, and supporters of the bill admit they would have no chance of switching enough votes to get the two-thirds necessary to override the President.

"Big city" pressure from the northern consuming areas was seen by observers as influencing the President to throw aside powerful Democratic friends and supporters in Congress such as Sen. Tom Connally and House Speaker Sam Rayburn and allegedly back down from a reported promise he would sign the bill if it went to the White House in the form it finally took.

Reaction to the veto was what would be expected, with opponents of the bill lauding the President's action and supporters deploring it. But there is little indication that it will have any effect politically. Sen. Robert Kerr, author of the bill, saw its importance dampened because of the fact that the legislation had split party lines.

The strongest statements following the President's announcement came from Senators Connally and Kerr.

Expressing his disappointment, Connally asserted that producers and gatherers of natural gas have been discriminated against by "the strong arm of the law, operating through a tyrannical and arbitrary bureau, fixing their prices," a practice that does not prevail as to other commodities.

Kerr declared the veto will deny independent producers the right to sell their gas in interstate commerce with the same freedom with which they can sell it at home, and predicted the result will be less gas and higher prices to the consumer.

Reportedly, the President had promised Senate and House leaders he would accept the bill if it was passed, and observers pointed out that some understanding must have been reached since Senate Majority Leader Lucas said he would not have brought the bill up had he not been given some assurance of acceptance by the White House.

Senators who fought the bill hailed the veto, as was to be expected, while supporters said flatly they thought it was purely political.

The President's veto conclusively closed the door to any chance of new legislation this session. Supporters of the bill will wait to see how the Federal Power Commission behaves now that it has the unqualified support of the President, and while they place little dependence in Truman's promise that he would not object to any "reasonable" amendments to the Natural Gas Act if they are found to be needed, will work vigorously for new legislation next year if the FPC fails to make good on the President's assumption it will not harass natural-gas producers and gatherers.

In his veto message, President Truman said:

"This bill would preclude the Federal Power Commission from regulating sales of natural gas to interstate pipe-line companies, for resale in interstate commerce, by producers and gatherers who are not affiliated with the buyers. After careful analysis and full consideration, I believe that such an action would not be in the national interest.

"I believe that authority to regulate such sales is necessary in the public interest because of the inherent characteristics of the process of moving gas from the field to the

WATCHING WASHINGTON

Bertram F. Linz

Little Business

The Senate is going to make another try at solving the problems of little business, with a brand-new committee none of whose members has ever before served in a similar capacity.

Four years ago Sen. James E. Murray of Montana headed a Senate small business committee, and in the Eightieth Congress Sen. Kenneth S. Wherry of Nebraska was chairman of another. The resolution providing for a similar committee in this Congress was sponsored by Wherry, but neither he nor Murray will serve on it.

Membership of the committee was named by Vice President Barkley, who put Sen. John J. Sparkman of Alabama in as chairman and included as members several outspoken champions of small business such as Senators Guy M. Gillette of Iowa, sponsor of oil-industry divorce bills; William Benton of Connecticut; Russell B. Long of Louisiana, foe of basing-point legislation; and Charles W. Tobey of New Hampshire.

Barkley told the Senate he was giving the committee a new look partly because if he appointed some members of the previous committees and not others "implications might arise" as to the reasons for his selection, and partly because a number of new men have entered the Senate who are not overburdened with committee work as are older members.

Basing Point

Opposition to the so-called O'Mahoney basing-point bill is gaining momentum, and if the conference report already approved by the House gets through the Senate it will be by a slender margin.

Aware that Senators Russell B. Long of Louisiana, Estes Kefauver of Tennessee, and Paul H. Douglas of Illinois are prepared to talk extensively against the bill, the Senate has put off dealing with the bill until it disposes of legislation considered more essential by the administration.

The O'Mahoney bill is designed to offset the effect of the Supreme Court decision outlawing basing-point prices in the Cement Institute case, by permitting sellers, acting independently, to quote delivered prices and absorb freight. It was introduced last June after extensive committee hearings at which the issue was debated vigorously. The Senate and House passed different versions and were unable to compromise their differences until a few weeks ago.

The Federal Trade Commission, whose activities started the whole controversy and whose members could not agree among themselves on the basing-point issue, is opposed to the measure. It now says the bill, far from clarifying the law with respect to delivered prices, further confuses the confusion and, if enacted, will give rise to a long period of litigation and uncertainty. Commission counsel still hold it is not a violation of law for a seller to quote delivered prices or absorb freight and, accordingly, the bill is not necessary.

The situation has been further confused by the long delay of the Supreme Court in passing on the Standard Oil Co. (Ind.) case involving good faith in cutting prices to meet competition as a defense against charges of restraint of trade, which is the core of the O'Mahoney bill.

Elk Hills Again

Standard Oil Co. of California and the Navy Department are engaged in new negotiations relating to the production operations in the Elk Hills naval petroleum reserve, but the bases of dispute between the Government and the company have not been disclosed.

Navy officials decline to discuss the matter, but the company has disclosed that it has retained special counsel in Washington to represent it in the making of arrangements as to future production operations. Its representatives are the law firm recently organized by Clark M. Clifford, formerly special counsel to President Truman, and Edward H. Miller, former special assistant to the Attorney General in the antitrust division of the Department of Justice.

Standard, owner of a substantial part of the land which comprises Naval Petroleum Reserve No. 1, operates the entire field under a unit-plan contract with the Navy.

The current negotiations may possibly be based on the Navy's decision to slow down development of the reserve, cutting expenditures for the coming fiscal year by some $5,400,000 to approximately $3,400,000, reducing operating activities from seven to five drilling rigs, and deferring the construction of some planned facilities.

consumer. Unlike purchasers of coal and oil, purchasers of natural gas cannot easily move from one producer to another in search of lower prices.

"Natural gas is transported to consumers by pipe lines, and is distributed in a given consuming market by a single company. The pipeline companies, and in turn the consumers of natural gas, are bound to the producers and gatherers in a given field by the physical location of their pipe lines, which represent large investments of funds, and cannot readily be moved to other fields in search of a better price.

"These characteristics of the natural-gas business impose natural limitations upon effective competition among sellers. Competition is further limited by the degree of concentration of ownership of natural-gas reserves.

"While there are a large number of producers and gatherers, a relatively small number of them own a substantial majority of the gas reserves. Furthermore, the demand for natural gas has been growing phenominally in recent years, and its natural advantages as a fuel, coupled with its present price advantage, indicate that demand may soon be pressing hard upon total supplies.

"Under these circumstances, there is a clear possibility that competition will not be effective, at least in some cases, in holding prices to reasonable levels. Accordingly, to remove the authority to regulate, as this bill would do, does not seem to me to be wise public policy.

"It is argued that regulation of sales of natural gas to pipe-line companies would discourage producers and gatherers from selling their gas in interstate commerce, and would discourage exploration and development of new wells.

"This claim rests primarily on the assumption that the Federal Power Commission would apply standards of regulation which did not take account of the peculiar circumstances of natural-gas production — such as cost of exploration and development, including the drilling of dry holes.

"I do not believe this assumption is well founded. On the contrary, I am confident that the commission will apply standards suited to the special risks and circumstances of independent natural-gas producers and gatherers.

"My confidence in this outcome is supported by the fact that, until recently, the commission has not found it necessary to undertake to regulate the prices charged by independent gas producers and gatherers, although those prices have been advancing.

"It is only natural that prices have risen, since the interstate lines built during and since the war have offered a far wider market than existed previously and have resulted in more competition among buyers. This process of price adjustment will probably

continue, and it is right that it should if held within reasonable limits.

"Accordingly, producers and gatherers are finding, and I am sure will continue to find, strong incentives to search out new sources of natural gas and to sell their gas in interstate commerce.

"I believe the production and sale of natural gas will continue to grow rapidly, to the benefit of consumers and of all the business men concerned with serving them. I see no danger to that growth in the continuance of the authority of the Federal Power Commission to regulate sales of gas to interstate pipe lines.

"The continuance of that authority will adequately protect the public interest by permitting the commission to prevent unreasonable and excessive prices, which would give large windfall profits to gas producers, at the expense of consumers, with no benefit to the nation in terms of additional exploration and production. Such cases are few, if any, at the present time, but the authority to deal with them in the future clearly should not be dissipated.

"Experience may demonstrate that some improvement of the existing statute may be desirable.

"I have no doubt that the commission will operate reasonably and in the public interest in carrying out the present law, but I would have no objection to reasonable amendments if they are found to be needed.

"To withdraw entirely from this field of regulation, however, impelled only by imaginary fears, and in the face of the record of accomplishment under the present law which is successful from the standpoint of consumer, distributor, carrier, and producer alike, would not be in the public interest. Accordingly, I am compelled to return this bill without my approval."

Oil-Loan Attack

RFC's approval of Texmass loan criticized before Senate committee; Warren threatens to take case before Congress

Bertram F. Linz

WASHINGTON.—The first large oil loan ever granted by Reconstruction Finance Corp. last week came under fire before a Senate investigating committee.

Observers watched the proceedings for an indication of the view the Government may take of any future loan applications from the petroleum industry.

Comptroller General Lindsay C. Warren told the committee that, on the face of the evidence now available, an $11,000,000 loan by RFC to Texmass Petroleum Co., Dallas, was a "transaction without authority of law."

Top officials of the RFC, however, contended the loan was legal, despite the admitted fact that recommendations that it not be granted had been submitted by M. M. Garrett, a consulting geologist employed by the agency to survey the company's oil properties; the examiner of the Dallas office, where the application was filed; the RFC examiner in Washington, and the board's own review committee.

Background.—Testimony developed at a hearing before a Senate banking and currency subcommittee headed by Sen. J. W. Fulbright of Arkansas which is investigating the RFC showed that Texmass originally sought a loan of $22,500,000, later cutting it to $15,638,513, and the RFC last September approved a loan of $15,100,000 of which $4,000,000 would represent insurance-company money already in the company.

The loan was approved by the RFC board by a vote of 2 to 1, Chairman Harley Hise having disqualified himself because a cousin had married one of the individuals who would benefit and the fifth member being ill.

The company originally was given 60 days in which to comply with RFC requirements, but subsequently secured extensions to 150, 180, and finally 210 days. The latter term will expire April 27 and the Dallas office, L. B. Glidden, manager, testified, is working "night and day" to beat the deadline. So far, none of the $11,100,000 has been released by the RFC.

Under the law, the RFC can make no loans that cannot be repaid in full within a period of 10 years.

Financial aspects.—The Comptroller General testified that Garrett's report stated that while the schedule of income, costs, etc., prepared by the company could be met and it was reasonable to assume that the interest and principal payments on the loan could be made as proposed to fully retire the loan on the basis of this schedule will require nearly 20 years.

The company itself, in its final prospectus filed with the Securities and Exchange Commission, Warren said, admitted that "even if during the 10-year period the company makes the minimum payments required by the loan agreement, there will remain at the end of such period an unpaid principal amount of approximately $6,150,000, which will then be due and owing."

In the light of that fact, the company said, investors should realize that the securities offered "are highly speculative, that they have no present value, and that any future value thereof is very remote and is dependent upon future development of substantial additional oil and gas reserves which cannot be counted upon."

Review action.—The review committee, Warren testified, recommended rejection of the application on the grounds that the loan has little if any public interest; the proposed rehabilitation of wells is in reality a salvage operation for which there should be a further injection of risk capital, and a loan of an amount that would properly rehabilitate and develop the properties is not warranted; the loan is largely a bail-out of investors and certain creditors "who presently appear to be faced with a loss," and Garrett's report does not find sufficient tangible collateral.

Previously, the Dallas examiner had recommended rejection of the loan originally sought because approximately 66½ per cent of it was to be applied to repayment of existing indebtedness.

A schedule of the purposes to which the loan would be put showed that $8,258,371 would be applied to payment of debts to two insurance companies, Republic Steel Corp., several banks, and a number of individuals; another $1,340,000 would be used for acquisition of leasehold interests, and only $1,501,629 would go for working capital and expenses.

On the basis of these facts, Warren told the subcommittee that unless additional evidence to justify the loan is forthcoming he will "unhesitatingly" report it to Congress as a loan made without authority of law in that the 10-year repayment requirement had been ignored.

Loan defended.—Defending the loan, Hise said he had not studied it as carefully as he would have had he participated in its consideration but was confident it would be repaid.

He told the subcommittee he was not prepared to testify as to details of the negotiations but would submit a full report in written form. Approval of the loan, he indicated, was based on a new geological report which the subcommittee apparently had not found in its search of the record, and, Hise said, the over-ruling of the recommendations of the review committee was "not unusual."

Other data.—Testimony of Harry Heller, assistant director of the division of corporate finance of the Securities and Exchange Commission, showed that prior to the formation of Texmass, the promoters of the company sold working interests in oil leases in which they retained overriding royalties to some 350 investors in Massachusetts. The overriding royalties

and other assets were subsequently conveyed to Texmass.

Other information in the hands of the subcommittee showed that the RFC loan is part of a general plan of readjustment and consolidation which contemplates that the company's properties will become integrated in a single enterprise with other oil and gas properties owned by Petroleum Reserve Corp., Swiss Oil Co., Midway Oils, Inc., National Cooperative Refinery Association and two individuals, Ronnie B. Smith and J. A. Miller.

In his report, Garrett estimated that the company's oil reserves were approximately 12,500,000 bbl. In a survey for the SEC, Tell T. White, of its oil and gas unit, placed the maximum reserves on the undeveloped properties at 7,000,000 bbl., and the discrepancy appears never to have been reconciled although RFC representatives discussed the matter with the SEC.

Aside from the financial aspects of the loan, the subcommittee raised the questions whether, although there is no prohibition in law, it was proper that so speculative a loan should be approved by anything less than a unanimous vote of all five RFC board members; whether the board should ever act on a 2-to-1 vote when four directors are present; whether it is proper for an official of the RFC, even though he may not have participated in the loan decision, to accept employment by a borrower (Texmass proposed to employ Allen E. Freeze, assistant controller of RFC, as vice president, controller and director), and whether the RFC should have paid more attention to the findings of the SEC.

ROCKY MOUNTAIN

Imports Surprise

Brantly urges increased imports before Rocky Mountain A.P.I. meeting; Minckler warns against federal subsidies

CASPER.—The hot issue of increasing imports of foreign crude oil raised its head unexpectedly at the otherwise tranquil spring meeting of the Rocky Mountain District of the American Petroleum Institute's Division of Production here April 13-14.

J. E. Brantly of Dallas, president of Drilling & Exploration Co., canceled his scheduled address on "Prime Movers in Modern Drilling Practices" to urge the increasing importation of foreign crudes for national security, coupled with proration of domestic production.

His statements met with a cool reception from the many independent producers at the meeting. The unexpected interjection of the import issue did not break out into a debate at any of the sessions, but it evoked considerable critical comment among groups of oil men in the hotel lobbies and luncheon gatherings.

Brantly based his views on military needs in the event of another total war, and pointed out that the United States must continue to draw on foreign reserves or stand the risk of losing important concessions.

"The oil revenue has become so vital to the economy of countries like Venezuela, Saudi Arabia, and others that they will seek other outlets if cut off from United States markets," Brantly declared.

He advocated state regulation, rather than federal controls of domestic production and added that some method should be sought to liberalize taxes in order to encourage the domestic industry to continue exploration and development.

In the final analysis, he declared, the flush producing wells will have to bear the brunt of proration while marginal producers must be allowed to continue output at near capacity in order to protect existing reserves. The possibility of subsidies for domestic producers was also broached.

Oil stands alone.—On the other hand, Robert L. Minckler of Los Angeles, president of General Petroleum Corp., declared the industry must steer clear of government subsidies as one more avenue to the "hand-out state," and must safeguard its freedom of action as the best means of maintaining an ample supply of oil for the security of the nation.

Minckler, keynote speaker at the session, noted that the petroleum industry stood alone among the energy industries in meeting the growing demands of the nation, due largely to the relative lack of burdensome restrictions.

"The electric power industry has lost its freedom and is under the withering blight of governmental control; coal has lost its freedom to a labor dictatorship," Minckler asserted. "Only oil and natural gas have remained free to advance the standard of living and to bring an increasing supply of the good things of life to our people, and they have done just that."

Favored position. — Leading oil men at the meeting observed that the Rocky Mountain region is in a favored position at the present time. A. F. Barrett, division manager for General Petroleum, noted that the region is now producing around 230,000 bbl. of crude oil daily, of which it is refining approximately 180,000 bbl. daily. This leaves a balance of some 50,000 bbl. daily for export outside the Rocky Mountain region. It was estimated the Rocky Mountain region could increase its daily output to more than 250,000 bbl. per day under conservation management.

The meeting otherwise was devoted to papers and discussions on outstanding developments in the region, such as the rapid growth of the new Sussex area in Johnson County, Wyoming, and the discovery and develop-

Economic trends in the petroleum industry were discussed by these leading figures at the spring meeting of the Rocky Mountain district, A.P.I. Division of Production, in Casper April 13-14. Left to right: A. F. Barrett, Casper, division manager of General Petroleum Corp.; Robert L. Minckler, Los Angeles, president of General Petroleum and keynote speaker at the meeting; Zach K. Brinkerhoff, Jr., prominent drilling contractor, and J. E. Brantly, Dallas, president of Drilling & Exploration Co., who caused a stir by advocating increased importations of foreign crudes.

ment of new reserves in southwestern Nebraska. Several interesting technical papers were given, and G. F. McMillan of Gulf Oil Corp., Denver, reviewed progress made by the Rocky Mountain district of the Oil Industry Information Committee.

Squeeze cementing.—Many improvements could be made in squeeze-cementing operations, it has been revealed by laboratory and field tests, the meeting was told by George C. Howard of Stanolind Oil & Gas Co., Tulsa.

He particularly advocated slow pumping as requiring less cement, and said that high final squeeze pressures appear to aid materially in accomplishing successful jobs. He added that reduction of pressure in the casing during testing may be detrimental to the success of the squeeze job if the resulting differential pressure across the perforated interval is greater than that expected during production.

Sour crude.—Combating corrosion by sour crudes has been more or less on a haphazard basis until recently, but now basic research has divided the problem into four parts which should receive individual study, according to D. A. Shock, Continental Oil Co., Ponca City.

The corrosive environments which should be handled separately were described by Shock as (1) the well environment where the total produced fluids pass through or across the metal, (2) the water environment where water has separated from the total well fluids, (3) the oil environment where most of the water has been removed from the oil, and (4) the vapor-phase environment in which there is no liquid.

Field developments.—The special conditions in three Rocky Mountain fields of current interest were discussed at the meeting.

J. L. Fusselman, Trigood Oil Co., Casper, and L. L. McDonald, Pure Oil Co., Chicago, discussed production problems in Worland field, Washakie County, Wyoming, where the deep wells have an abnormally high concentration of deadly and corrosive hydrogen sulfide gas. It was necessary to use a hot-oil circulating string to prevent plugging of the tubing with gas and with hydrogen sulfide hydrates. Stage separation was designed to permit the greatest yield of hydrocarbon liquids possible, but the problem will be eased with completion of a sulfur extraction and recovery plant which will take the gas from a central crude-oil stabilization plant.

Sussex Unit field in Johnson County, Wyoming, where an active drilling campaign is in progress, was described by E. Y. Long of Continental Oil Co., Lance Creek. Situated on the northeast side of the north-plunging nose of the large Salt Creek anticline, this field has pay sands in several different formations. The Lakota oil at reservoir conditions is undersaturated, having a bubble-point pressure of 1,447 psi. and a solution-gas-oil ratio of 528 cu. ft. per barrel. Two recent discoveries south of the field have increased interest in the area.

Recent discoveries in Cheyenne County, Nebraska, were described by William L. Hershelman, Ohio Oil Co., Casper. Discoveries to date, he said, indicate that the Julesburg basin, while still very little known, will yield substantial reserves in the future and that its development is just beginning.

Officers elected.—C. L. Larson, Jr., Rocky Mountain division manager for Stanolind Oil & Gas Co. at Casper, was elected 1950 chairman for the district, succeeding Zach K. Brinkerhoff, Jr., of the drilling company of that name. Brinkerhoff drew the chairmanship of the 25-man advisory committee.

Other new officers of the Rocky Mountain district include Rex Davis, Carter Oil Co., Cut Bank, vice chairman for Montana; W. P. Tallant, Union Oil Co. of California, Denver, vice chairman for Colorado; C. H. Griffin, Phillips Petroleum Co., Casper, vice chairman for Wyoming; D. T. Hoenshell, General Petroleum Corp., Casper, vice chairman at large; and A. E. Campbell, Seaboard Oil Co., Casper, secretary-treasurer.

Members of the advisory committee include G. F. McMillan, Denver; W. M. Saxon, Pure Oil Co., Billings, Mont.; Charles A. Pickett, The California Co., Denver; Claude E. Peavy, Phillips Petroleum Co., Salt Lake City; Paul Kartzke, Shell Oil Co., Casper; William Jack, Rocky Mountain Oil and Gas Association, Casper; J. P. Moroney, Sinclair Oil Corp., Denver; S. J. Lintzenich, Hughes Tool Co., Casper; J. C. Johnston, Continental Oil Co., Denver; Richard Armstrong, Oil Well Supply Co., Casper; H. H. Arnold, The Texas Co., Denver; A. F. Barrett, General Petroleum Corp., Casper; James R. Chapman, Continental Supply Co., Casper; C. L. Cooksey, Carter Oil Co., Denver; J. F. Cullen, Stanolind, Casper; J. A. Deffeyes, Pacific Western Oil Co., Casper; James Donoghue, Mackinnie Oil & Drilling Co., Denver; H. B. Gernert, Trigood Oil Co., Casper; J. W. Gillespie, National Supply Co., Casper; Harold H. Healy, Ohio Oil Co., Casper; M. R. McArthur, Husky Refining Co., Cody; Fred M. Manning, Jr., Fred M. Manning, Inc., Denver; D. R. Murphy, Mountain Producers Corp., Denver; M. A. Park, Jones & Laughlin Supply Co., Casper; and Marion E. Tate, Noble Drilling Corp., Casper.

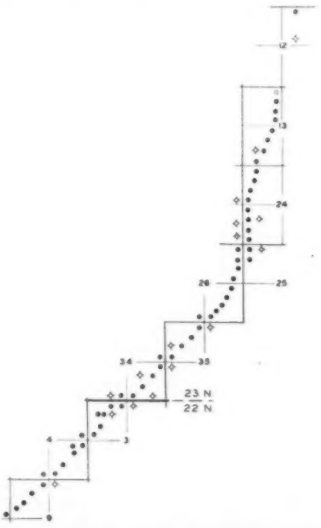
MID-CONTINENT

Odd Pool

South Ceres, only two wells wide, now 7½ miles long

Neil Williams

ANOTHER marker in proving the elongated, slender line of production of the South Ceres pool, central Noble County, Oklahoma, was established the past week with the completion by Sinclair Oil & Gas Co. of a good well located more than a mile north of the previous north tip of the pool.



South Ceres pool, Noble County, Oklahoma.

On initial gages, the extension well, 2 Sullins, NE NW NE 12-23n-1w, flowed at the rate of approximately 800 bbl. of oil daily through chokes. Its pay zone, the Red Fork sand (Pennsylvanian), is at a depth of 4,414-58 ft., about the same as in the South Ceres pool.

Production horizon of the pool has been designated as the Bartlesville sand. However, according to some interpretations, the Red Fork, or Burbank sand, correlates with the Bartlesville.

With the extension, the pool now stretches a length of more than 7½ miles, meandering along a northerly to northeasterly trend. Only one-well wide most of its length, and at no place more than two locations wide, the pool has proved unique in shape. Fifty-four producing wells have been completed along this line. The pool was opened in 1947.

Prior to the Sinclair extension, operators have been feeling out the line of production northward location by location on a 10-acre spacing. Currently, British American Oil Producing Co. is extending the north tip across its Schultz lease along the east line of the NW 13-23n-1w. It has completed its third well and now is drilling its fourth and last well on its lease.

That this line of production eventually will be extended and swing to the northeast to connect with the Northeast Longview pool, only 2 miles to the northeast of the Sinclair well, is considered possible.

The latter pool, opened in 1947, produces from what is designated as the Burbank sand, which some geologists believe to be the same as the Bartlesville sand of South Ceres pool.

Until recently the discovery well, originally completed by Davon Oil Co. but later acquired by Midland Co-operative, has been the only producer. Development, however, has been revived by the completion last month of a second well, located southwest of the discovery well, by Fordee Rhoades Oil Co. A third well now is being drilled by the latter company.

Deep Rock Strike Ends

TULSA.—Workers at the Cushing, Okla., refinery of Deep Rock Oil Corp. returned to their jobs April 17 after settlement of their 15-day-old strike.

Operations at the 13,000-bbl. per day unit were resumed after tentative terms of a new contract were accepted by the union. Under the contract employes will receive seven paid holidays this year, one more than given by other large companies. In addition, the company agreed to increase sick leave payments from 75 to 85 per cent.

Other features of the contract are a continuation of the union shop in the refinery, but for maintenance of a membership shop in the production and pipe-line departments. The union had asked for a union shop in these departments also. Union memberships will be maintained in them and new members added, but nonunion men will continue to hold their positions.

TECHNOLOGY

New Turbine

Lightweight gas turbine with wide fuels range, described by Boeing engineer; gas-pipe-line use believed promising

Leigh S. McCaslin, Jr.

GALVESTON.—A small, revolutionary gas turbine capable of using a wide range of fuels and having important potential applications has been developed by Boeing Airplane Co.

Henry C. Hill, propulsion engineer for the company which has built 15 of the units for the Navy over the past 2 years said the new Boeing Model 502 gas turbine:

1. Develops 175 hp. with a unit measuring 42 by 22 by 35 in. and weighing 312 lb.
2. Has an idling speed of 15,000 r.p.m.
3. Has one-tenth as many parts as a gasoline or diesel engine of the same power.
4. Has no moving parts in the combustion chamber.
5. Can operate on kerosine, gasoline, diesel oil, or Bunker C fuel oil, and developers believe that it is entirely feasible to operate on natural or artificial gas. Minimum fuel consumption using diesel oil is 1.25 lb. per b.hp.-hr.
6. As a complete engine is of a weight comparable to the transmission, alone, in piston-type internal-combustion engines.
7. For use in motor vehicles, a 200-hp. gas turbine will save at least 3,000 lb. in weight as compared with present truck engines.
8. Can be made into a good unit for gas pipe-line pumping by adding a high-speed centrifugal pump to the turbine. (Using the gas being pumped as fuel.)
9. Can be built in small quantities for $5,000-$10,000.

The Boeing engineer admitted that the turbine fuel consumption is "about twice that of the best gasoline engines, and nearly three times that of diesel engines."

However, he said, Boeing believes this may not be so serious a problem as it seems. In the first place, specific fuel consumption has been reduced from 1.5 to 1.25 lb. per b.hp.-hr. in the last 18 months. This indicates, he said, that further research will result in a still lower fuel consumption.

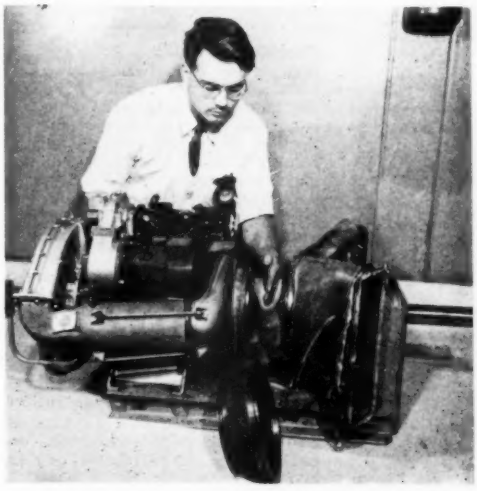
Besides continued improvement of details, Hill believes that there are several ideas based on theory which may help solve the fuel problem. These include: "regeneration, where exhaust heat is used to preheat the combustion air, higher pressure ratios by multistage compression, and higher combustion temperatures by special cooling methods for turbine nozzles and turbine blades."

A major aid in remedying the fuel situation may be the use of cheaper fuels. Some work has been done in the use of the heavier and cheaper fuel oils, but further development is needed, he said. General Electric Co. is already running a large gas turbine on Bunker C type fuels in an installation on a Union Pacific locomotive.

Hill outlined the modifications necessary to switch the turbine into a natural-gas burner. The pressure of the gas would have to be higher than the air pressure of the compressor discharge, which is about 36 psig. at full power. A centrifugal governor to limit gas pressure and thus prevent overspeeding would also be necessary, he thinks. The jets in the burners would have to be enlarged over those now being used for liquid fuels.

The two big problems which Hill believes need to be overcome at this early stage in the development of the small turbine are reliability and manufacturing cost. At present the turbine lags behind conventional piston-type engines in these respects. However, Hill believes that progress in improving reliability and reducing manufacturing costs "has so far been very much faster than was the case during the early development of automotive and aircraft piston-type gasoline engines."

Development of the turbine was discussed before the recent meeting of the Southern Gas Association here.



Experimental model of the 175-hp. Boeing gas turbine, showing its compact size. In this picture the central housing has been removed to show the lack of mechanical connection between the two turbine wheels which operate on the principle of a torque converter and provide a flexible drive.

Gas-Liquids Problem

Uneven state controls over production cause dissension among manufacturers; I.R.A.A. seeking further regulation

Roy F. Carlson

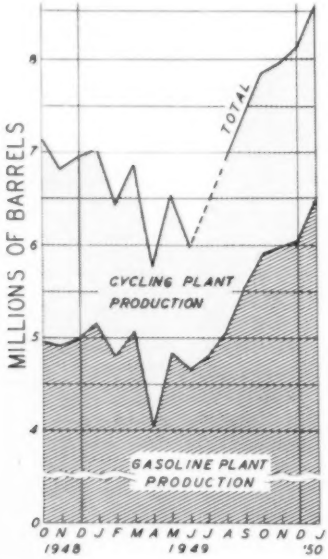
DALLAS.—The natural-gas liquids industry in Texas is in a difficult position.

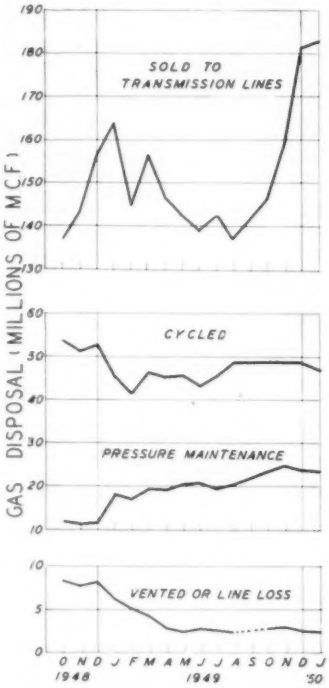
On one side the Texas Railroad Commission is stopping the flaring of casing-head gases and requiring the construction of more and more gasoline plants; on the other hand, refiners, through the Independent Refiners Association of America, are asking the commission to prorate the production of these natural-gas liquids.

Added to these troubles is the current Railroad Commission investigation into the flaring of unwanted excess propane and butane by gasoline-plant operators.

There are difficulties within the ranks too. Manufacturers who extract natural gasoline from casing-head gas argue that they cannot compete with producers who take natural gasoline and liquefied petroleum gas from gas-distillate production.

The trouble here arises from the fact that casing-head production is, in effect, regulated by oil-well proration, while gas-distillate production is limited only by the ability of the well to produce. The present allowable production from a gas-distillate well is usually one-fourth of its potential.




GAS DISPOSAL, MILLIONS OF M C F
SOLD TO TRANSMISSION LINES
CYCLED
PRESSURE MAINTENANCE
VENTED OR LINE LOSS
O N D J F M A M J J A S O N D J
1948
1949
'50

The production and construction picture is shown on accompanying charts.

Commission action. — Although the high levels of natural-gasoline and L.P.G. production cannot be wholly attributed to Railroad Commission stop-flaring orders, some of the production has undoubtedly come as a result. At least, construction on several plants was hurried by the orders, and the natural-gasoline production took the rapid rise depicted on the charts.

Although the Railroad Commission has for several years been investigating gas wastage, it began its concerted action in 1948. By late 1948 the Texas Supreme Court had held that the Railroad Commission had the power, where exercised reasonably, to close down an oil field in the interest of conservation. It was upon this decision that the commission based its shut-down orders, and consequently caused many gasoline plants to be completed.

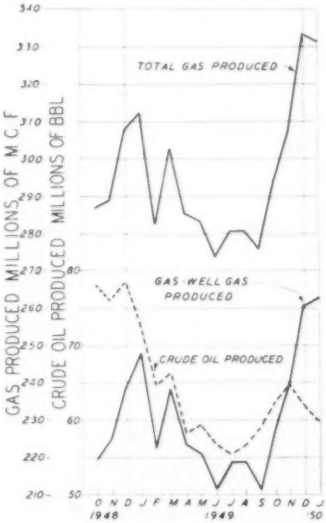
Since the 17-field shut-down orders of October and November 1948, the quantities of vented and flared gas have dropped from 8,192,399 M.c.f. to 2,332,419 M.c.f. for January 1950. This has taken place along with nearly uniform casing-head gas production. At the same time total natural-gas production has increased 44,249,637 M.c.f. per month from 286,878,808 to 331,128,445 M.c.f.

Plant construction.—Between October 1948 and February 1950, 45 gasoline plants were built, an increase from 219 to 264. The number of nonprocessing pressure-maintenance plants rose from 138 to 152, while the number of "recycling" plants—producers of L.P.G. and natural gasoline—remained nearly constant. The number of carbon-black plants, also large consumers of natural gas, dropped from 42 to 39 in the 1½-year period.

The rapid rise in the number of operating gasoline plants is shown on an accompanying chart. The sharp upturn occurred in January 1949 and, except for one short drop, has increased since.

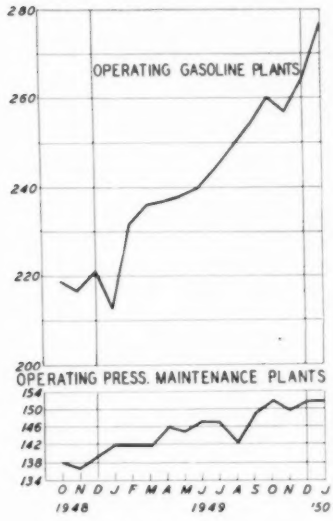
The installations termed "gasoline plants" are those operations that take casing-head gas or production from gas-distillate fields, strip the liquefied components, and dispose of the residue in some manner other than returning it to the ground. Most of the residue is sold to transmission lines for transportation to natural-gas markets.

Source of gasoline.—Evidently it is the natural-gas liquids taken from gas-distillate well production that is causing the high stock levels of liquefied products. However, it evidently


GAS PRODUCED, MILLIONS OF M C F
CRUDE OIL PRODUCED, MILLIONS OF BBL
TOTAL GAS PRODUCED
GAS-WELL GAS PRODUCED
CRUDE OIL PRODUCED
O N D J F M A M J J A S O N D J
1948
1949
'50

is the dry gas that is the desired product from these wells, the liquid being produced almost incidentally to the preparation of the gas for transmission.

According to Railroad Commission data, the amount of casing-head gas produced per month since the stop-flaring orders has remained nearly the same, and about the same amount of it has been processed in gasoline or recycling plants. The state-wide ratio of casing-head gas to oil production is roughly 1,000 cu. ft. per barrel.



On the other hand, gas-well production increased 43,312,858 M.c.f. per month during the same period. The amount of this production being processed in gasoline and recycling plants has increased 35,063,915 M.c.f. per month for a like period.

Since the number of recycling plants has remained nearly constant, with nearly a uniform throughput, most of this increased gas production has been processed in gasoline plants. These plants are either new ones, or old ones that are operating at a much higher rate than previously.

The gasoline plants, therefore, are responsible for the high levels of natural-gasoline stocks in Texas. Most of the increase in gas-liquids production is being obtained from gas-distillate fields. In October 1948 these gasoline plants produced 4,861,085 bbl. In January 1950 production from the plants was 6,515,425 bbl. Recycling-plant production was about constant and during January constituted about one-fourth of the state total.

Residue gas.—Simultaneously with the increase in liquid production and probably the reason behind it, since dry gas is often the desired product, has been the rapid expansion of natural-gas markets and the tremendous increase in the amount of gas sent to transmission pipe lines. And the year 1950 will probably be the largest in pipe-line history, in both construction and in volumes of gas handled.

Late in 1948 gas was moving into transmission lines at a rate of about 4 billion cubic feet per day. In January 1950 nearly 6 billion cubic feet per day was being sent, about 183,000,000 M.c.f. for the month. This represents 55 per cent of all the gas produced in Texas during January.

Also in January, 47,211,698 cu. ft. or 14 per cent of Texas' gas was being cycled. The remaining markets for gas such as plant fuel, gas lift, pressure maintenance and repressuring, carbon-black manufacture, and venting and line losses each constitute less than 10 per cent of the total gas production. Volumetrically these quantities have remained about the same for several months, while the transmission lines have been consuming a larger and larger percentage of the total production.

Although the rate of increase of transmission of gas in pipe lines slowed during January, other markets for the gas showed a decline. Since the transmission lines take the lion's share of the gas, and since this share will probably increase in the future, and further, since this will probably mean more production of natural-gas liquids, the supply picture for these liquids will probably get worse rather than better—barring action by the Railroad Commission to forestall this situation.

INDUSTRY AFFAIRS

Army's Lube Specs

Commercial use of military's new heavy-duty lubricating oil is criticized by some speakers at N.P.A. meetng

Dahl M. Duff

CLEVELAND.—The first public announcement of the new specifications for the military's heavy-duty engine oil and the reasons for their revision was made here by Army Ordnance representatives at the forty-seventh semiannual meeting of the National Petroleum Association April 12-14.

The round-table discussion of the new Military 2104 engine oil, a talk by Dr. Robert E. Wilson on the historical growth of competition in the Standard Oil Co. (Ind.) territory, and an interpretation of changing concepts of the antitrust laws by a Massachusetts Institute of Technology economist were the outstanding features of the N.P.A. meeting.

The Army's specification 2104B, which has been used without change for the last 10 years as the standard for heavy-duty diesel and gasoline-engine oil, will be superseded not later than June 1951. The new specification 2104 will contain more severe qualification requirements, principally in the fuel used in the test engine.

Commercial importance.—The importance of the new military specification lies not only in the immediate military market for engine oil but also in the fact that it becomes the standard for commercial users of heavy-duty oils such as truck and bus fleets. The product of many lubricating-oil manufacturers will qualify, under the new specification, but in other cases, oils must be reappraised and upgraded with, principally, detergent additives.

"During the war, the 2104B oils performed satisfactorily in general," R. E. Streets, of the Ordnance Research and Development Division, told the N.P.A. "However, fuels used during that period were predominantly straight-run products of low sulfur content. It must be noted that in the event of another emergency the fuels available for use in Army ground equipment will be composed predominantly of cracked stocks, having a wider distillation range and higher sulfur content."

The Army's objective is to obtain a lubricating oil which will more effectively hold down sludge formation, clogging of rings and pump screens, and engine dirtiness in general. The old 2104B specification had no sulfur or end-point minimum for the fuel used when the qualification test was made for the oil itself. The fuel prescribed in the new specification has a 0.35 per cent sulfur-content minimum, and an end point in the 650°-690° range. Octane number will be 40-45.

Much opposition.—A mixed reception on the part of the industry to the revised military specifications was evident in the comments given by representatives of several companies. C. O. Tongberg, Standard Oil Development Co., in a paper coauthored by C. W. Bohmer, Jr., Esso Standard Oil Co., raised several points, among them a general objection to the acceptance of military specifications by commercial users.

"We feel very strongly that there should be a separation between the

Among those attending the semiannual meeting of the National Petroleum Association in Cleveland was this group: W. A. Tracy, Sinclair Refining Co., Washington; E. P. Shipley, Sinclair Refining, New York; Harvey Jensen, Tide Water Associated Oil Co., New York; P. W. Zumbrook, Sinclair Refining, New York; B. L. Meece, Globe Oil & Refining Co., Chicago; B. L. Majewski, Deep Rock Oil Corp., Chicago; and F. W. Robinson, Boler Petroleum Co., Philadelphia.

requirements of the military and the requirements of civilian automotive equipment," Tongberg said. "Military and civilian requirements are significantly different. The use of a common specification will, therefore, either give the military a product which will not meet its requirements, or force the commercial operator to use a higher-priced product in place of one which is already giving him satisfactory service."

Caterpillar Tractor Co. began to prepare to change its recommendation for 2104B oil last year after a wide range of performance was found when using this oil with fuels of high sulfur content, said L. A. Blanc, associate director of research of the Caterpillar company. The company now plans to recommend the new Military 2104 oils as soon as it is possible to describe them adequately to its customers.

Streets, for Ordnance, said the new specification is expected to remain substantially unchanged at least the next 5 years since it is considered a reasonable compromise between gasoline and diesel-engine requirements and wartime availability. He said the Army on competitive bids usually obtained the lower-quality-level oils out of the wide range represented on the list of approved products.

No monopoly.—Dr. Wilson, chairman of Indiana Standard, reviewed the history of the Indiana company from its beginnings as one of the combined Standard Oil subsidiaries. His thesis was that a case history of the Indiana company shows continually increased competition in the petroleum industry, or more broadly, "how the free working of economic laws prevents monopoly and provides opportunity for growth of the efficient and for entry into the business of men with new ideas. "

"In these days, your problem is no longer to beat the 'Great Octopus,' " Dr. Wilson said. "It is, rather, to retain the reins of your business free from seizure by Big Government. This is a problem all business units face—large and small."

The Indiana company head told in detail of the numerous companies that have moved into the 15-state territory of the company in the Central Midwest and taken permanent shares of the market. In 1902, for example, Indiana Standard did fully 85 per cent of the total oil business in its territory, while today it does less than 20 per cent.

Discussing ways in which competitors have won a place in the marketing area, Dr. Wilson said price cutting had been one of the chief weapons used against his company. "For many years our company labored under the unsought title and handicap of being regarded as the 'price leader' in its territory," he said. "The difficulty about carrying that 'onus' is that the price leader is usually the first to raise prices and the last to reduce them. There is always a period after the raise and before the reduction when its competitors are joyfully taking business away from the leader by underselling."

Although Indiana Standard's percentage of its market has declined far below what it held after dissolution of the old Standard Oil Co., the story is not one of the decay of a business. "The offsetting factors are, of course, the rapid growth of the total volume and our expansion into other branches of the business," Dr. Wilson added.

"No matter how wise the management of Standard Oil Co. (Ind.) might have been and no matter how much it might have wanted to hold the company's predissolution position, it never could have done so. The growth of the market for oil products was just too vast a thing for any one group of men to keep pace with."

Integration in danger.—Dr. N. A. Adelman, assistant professor of economics at M.I.T., was sharply critical of some of the contradictory aspects of present antitrust policy of the Government. He said the petroleum industry is likely to be seriously affected by the drive against integration which in some cases the Government has treated as illegal per se.

"The safest motto for an integrated company appears to be (1) hire a good lawyer, (2) hire a bad accountant, and (3) don't compete hard," he said. "Don't let your own self know what the various divisions of your business are doing, for that means they are necessarily subsidizing one another.

"If your integrated operation is really a source of efficiency, be content with some addition profits on whatever business you have, but don't go after any additional business in any aggressive way. Size is usually dangerous; although, there are exceptions to this rule, the attack is usually on big companies."

However, Dr. Adelman said it is improbable that antitrust policy will go as badly as it is now tending since its "more silly and self-contradictory" aspects are becoming clear. The issue, he said, is whether we shall sacrifice a highly concentrated and highly competitive economic system in order to have competition in the sense of protection for many small competitors.

Resolutions.—At the Cleveland meeting, resolutions opposing federal government reorganization proposals which would abolish the independent office of general counsel of the National Labor Relations Board and transfer the wage-hour administration to the Department of Labor, were voted by the association trustees.

Texaco Sues Union

BEAUMONT, Tex.—The Texas Co. has filed a $500,000 suit against officers and agents of Oil Workers International Union, Local 228 of Port Neches, Tex., alleging a strike called April 4 at its asphalt plant near there was in violation of labor agreements then in effect.

R. C. Schorlemmer, plant superintendent, filed the suit in federal court, the petition alleging the strike shut down the refinery and completely stopped its operation. The union filed unfair labor practices charges against the company earlier in the week.

Earlier, the end of the strike at Texaco's 60,000-bbl. refinery at Lockport, Ill., April 15 reduced to four the number of plants shut down by the series of C.I.O. local strikes against the company.

These four include the Casper,

Wyo.; Port Arthur, Tex.; Port Neches, Tex.; and Lawrenceville, Ill., units involving an operating capacity of 271,000 bbl. Other major plants at Tulsa, Los Angeles, and Westville, N. J., with a capacity of 120,000 bbl. per day have continued to operate throughout the strike.

Centering around pension proposals, the walkout has idled between 7,000 and 8,000 men. About 700 were out at Lockport.

U.O.P. Asks Review

CHICAGO.—Universal Oil Co. will ask the Supreme Court to review a decision of the Circuit Court of Appeals last week holding that U.O.P. is subject to federal income taxes even though its profits go to the American Chemical Society which is a nontaxable research and educational organization.

President David W. Harris denied that the tax claims in issue approach the figure of $5,000,000 mentioned in some newspapers, and said that the company has regularly reported and paid its taxes while contending that it is not liable.

Aminco Sale

Phillips buys Sunray stock, negotiating for Globe's

SUNRAY OIL CORP., Tulsa, has sold the major portion of its stock in American Independent Oil Co., which owns 50 per cent of the concession in the Kuwait-Saudi Arabian neutral zone and has a drilling contract with Petroleos Mexicanos.

The Oil and Gas Journal learned on good authority that the Sunray stock was purchased by Phillips Petroleum Co., Bartlesville, already the largest single owner of Aminco stock.

The Journal also learned that Globe Oil & Refining Co., Wichita, has offered all or part of its stock in American Independent for purchase by the other partners, as provided by Aminco bylaws, and that Phillips is negotiating to purchase it. The deal was expected to be concluded this week. Globe and its subsidiary, Lario Oil & Gas Co., together owned 6⅔ per cent of Aminco stock.

Sunray originally owned 6⅔ per cent of American Independent, but as the result of its recent sale its ownership is now 1.42 per cent. It is understood that the stock sold netted Sunray more than it originally paid for the entire block.

Deep Rock Oil Corp., Tulsa, was another original partner in American Independent, owning 6⅔ per cent of the stock. Last February it sold approximately half of its stock for $1,110,000 cash, as compared with about $1,000,000 paid for its stock when the company was formed. Purchasers were four other partners in Aminco: Phillips; Sunray; Signal Oil & Gas Co., Los Angeles; and Hancock Oil Co., Long Beach.

Other stockholders in American Independent are Ashland Oil & Refining Co., Ashland, Ky.; J. S. Abercrombie Co., Houston; and Ralph K. Davies, president of Aminco, San Francisco.

SOUTHWEST

Gas Measurement

O. U. Short Course draws record group of oil men

John C. Reidel

NORMAN, Okla.—The increased importance to the oil industry of natural gas and its liquid products was reflected in the new high in attendance and interest at the Southwestern Gas Measurement Short Course of the University of Oklahoma April 11-13, the twenty-fifth of an annual series.

Registration totaled 925, compared with 60 at the first course in 1924. Those attending were a cross-section of the petroleum industry and included vice presidents and superintendents as well as engineers, gas testers, and meter men.

Thirty equipment manufacturers contributed to the educational exhibits.

Eighty classroom sessions were held covering fundamentals of gas measurement and regulation, automatic controls, operation and maintenance of equipment, gas contracts, and accounting. Subjects of special interest included "Gas Regulation at Extremely High Pressures," "Deliverability Method of Rating Gas Wells," "Supercompressibility Factors," and "Back Pressure Tests of Gas Wells."

A round-table discussion was held on "Determination of Gasoline Content of Gas." Outstanding men in their various fields were selected as instructors, from the oil and gas industry, equipment manufacturing companies, and University of Oklahoma faculty.

Principal address on the opening day was given by J. H. Russell, vice president of Gulf Oil Corp., who stressed the growth of the industry and the trend toward natural-gas conservation.

"Now that we are annually stripping more than 550 billion cubic feet of gas in the 34 recycle plants in Texas alone, and returning much of that gas to the ground to help maintain future hydrocarbon production, the community of interest between the oil and gas industries is becoming more and more apparent," Russell said.

"Last year the industry grew in every direction. Gas-transmission companies were operating 260,000 miles of pipe lines to serve consumers. During the first 6 months of 1949 the Federal Power Commission had authorized construction of an additional 4,900 miles. At that time there were 8,500 miles of pipe lines under construction and 14,600 miles were pending approval by the commission. If or when these additions are completed the total mileage will amount to 288,000, enough to circle the earth at the equator nearly 12 times."

Scurry Study

Kelley, North Snyder single reservoir, engineers say

AUSTIN.—Engineering data indicate that Kelley and North Snyder pools in Scurry County probably constitute a single reservoir. That the Diamond M and Sharon Ridge Canyon are part of the same reservoir appears to be doubtful.

Testimony of engineers at the Texas Railroad Commission hearing on the Scurry County fields showed that there are insufficient data at present to reach any final conclusion concerning the fields. The one conclusion that can be drawn about the reef generally is that everything about it is extremely erratic, in spite of the fact that there is probably more data available on the Scurry County pool than any other area in the world in a like stage of development.

Exhibits presented at the hearing showed that the structural characteristics of a reef vary widely and rapidly within very short distances laterally. Location of the water level in the fields is difficult, and few wells have been drilled to water.

From the data given the water level is apparently different in each of the four Scurry County reef fields. Porosity also varies vertically and horizontally through the reef structure and bears little relation to the position of reef and pool boundaries.

Differences in bottom-hole pressure in the four pools, variations of water level, viscosity differences, the presence of hydrogen sulfide gas in Sharon Ridge Canyon production, and lack of adequate performance data led operators to ask that the reservoirs not be combined and operated under a single set of field rules at this time.

It is expected to be a long time before adequate performance data on the reservoir becomes available since the pools are all prorated.

As far as the continuity of the

reservoirs is concerned, there is not much space now remaining between any of the pools, and since drilling is being carried on rapidly that question is expected to be resolved before any sure conclusions can be drawn from performance or reservoir data.

Testimony concerning Cogdell field, north of the North Snyder field in Kent County, suggested that although production there is coming from a reef similar to those found in Scurry County a saddle or nonproductive area must occur in the reef between North Snyder and Cogdell pools.

SCEC Establishes Office

AUSTIN. — Texas' Statewide Citizens Economic Committee, appointed by Gov. Allan Shivers to combat the high rate of imports of foreign oil, has completed its organization.

Meeting here last week the executive committee voted to establish an office in Austin and elected W. P. Z. German, Jr., Midland, executive secretary.

The SCEC was organized on the suggestion of William J. Murray, Jr., chairman of the Texas Railroad Commission. Its membership contains representatives of almost all economic segments and areas of the state.

Allowable Hike

Lube-base crude fields given 22,000-bbl. boost

AUSTIN—The Texas Railroad Commission last week boosted the state's May allowable 58,241 bbl. daily over April, and gave 22,000 bbl. of the increase to 21 pools that produce a lube-base crude.

A special provision in the order permitted 50 fields producing crude oil used in manufacture of lubricants to produce on the old "MER" basis. Of the 50, 29 already were operating on that basis.

The increase for the remaining 21, all of them on the Gulf Coast, was granted after representatives of Humble Oil & Refining Co. told the commission the company might have to look to areas outside of Texas for its supply of lube-type coastal crude if additional production were not made available.

Humble representatives said their company has a firm demand for 56,600 bbl. daily of this crude, a special type from which low-cold-test lubricants are made. They estimated that with 18 producing days in May under the "1947 yardstick" method of proration the company would be short of demand by more than 18,000 bbl. daily.

The commission set the May allowable at 2,179,586 bbl. daily, with 18 producing days for the 31-day month.

The increase in Texas' allowable came after a Bureau of Mines forecast that demand in the state would increase 30,000 bbl. daily over the April figure.

Statistics of the Bureau of Mines for the week ended April 8 showed that stocks of Texas crude had dropped during the week at a rate of 209,857 bbl. daily.

Allowables for May, by districts, are shown in the accompaying table.

TEXAS ALLOWABLE

District—	May	Increase
1—Southwest	29,626	230
2—Southwest	124,916	2,692
3—Gulf Coast	394,287	27,691
4—Southwest	199,920	3,394
5—East Central	32,456	671
6—E. T. (outside)	84,934	1,531
6—East Texas	264,106	6,024
7B—West Central	79,283	742
7C—West Central	52,727	720
8—West Texas	635,493	13,128
9—North Texas	174,368	1,415
10—Panhandle	107,466	3
Total	2,179,586	58,241

ASSOCIATIONS

N.G.A.A. Convention

FORT WORTH. — What's new in handling liquefied petroleum gases will provide the theme of the twenty-ninth annual convention of the Natural Gasoline Association of America, to be held here April 24-26.

A highlight of the technical program will be a paper on the underground storage of L.P.G., prepared by C. R. Williams, vice president, and C. B. Johnson, chief engineer, of the Chicago Corp.

Other papers on the 2-day program include:

Monday, April 24

"Modification in L.P.G. Test Methods," H. A. Montgomery, Warren Petroleum Corp., Houston; "The Accuracy of Low-Temperature Fractional Analysis of Liquid Hydrocarbon Mixtures," A. J. Miller, Phillips Petroleum Co., Bartlesville, Okla.; "Cures for Corrosion in Gas-Condensate Wells," W. H. Stewart, Sun Oil Co., Beaumont; "The Vapor Pressure of Liquefied Petroleum Gases," Joe F. Wood, Skelly Oil Co., Pawhuska, Okla.

Tuesday, April 25

"Centrifugal Compressors," E. A. Koenig, Texas Eastern Transmission Corp., Shreveport; "Industry's Training Job," Willard G. Wiegel, Lone Star Gas Co., Dallas; "Cooperation Between the Oil Industry and Regulatory Bodies with Respect to the Marketing of Residue Gas," Paul Kaiser, El Paso Natural Gas Co., El Paso.

Natural-Gas Meeting

TULSA.—A program for both gas-company executives and operating men has been planned for the spring meeting of the Natural-Gas Department of the American Gas Association, to be held in the Mayo Hotel, Tulsa, May 8-9.

Technical papers, to be presented on the second day of the meeting, will include:

"Transmission - Line Type Storage — Capacity Calculations and Cost," W. C. Mosteller, Southern Counties Gas Co., Los Angeles; "New Data on Use of Solid Desiccants," E. Paul Wilkinson, Magnolia Petroleum Co., Dallas, and Boris Sterk, Socony-Vacuum Oil Co., Brooklyn; "Trace Removals of Sulfur Compounds from Natural Gas," J. L. Oberseider, Southern California Gas Co., Los Angeles.

EASTERN

Pennzoil Adding Unit

OIL CITY, Pa.—A contract for a propane - deresining and resin - fractionating unit at its present lube-oil plant at Rouseville, Pa., has been awarded by Pennzoil Co. to M. W. Kellogg Co. The unit will be designed to charge 1,370 bbl. of Pennsylvania reduced crude each day. It is scheduled for completion the latter part of the year.

Products will include light-colored, low carbon - residue deresined oil, which will be further processed for the manufacture of high-quality lubricating oils, and three resin fractions of exceptionally high viscosity which are expected to find markets as specialty products.

NEXT WEEK

Journal readers next week will receive two special issues under one cover. It's a pretty appropriate situation, too.

First portion will be the Journal's annual treatise on "Exploration," which will tell about new methods and procedures the oil finders are using. Spotlighted will be the happenings at the annual meeting of the American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists.

Second portion will be on "West Texas," a region which needs no introduction to most drilling and production men and which is a crude oil source for many refineries. This special section in its list of articles will give a lot of brand new know-how and engineering-operating material for all branches of the industry.

P. S.—The issue also will be accompanied by an insert multicolor wall map on **West Texas Oil,** showing oil and gas fields, pipe lines, natural-gasoline plants, and refineries.

P. P. S.—The map isn't just one map; it is two maps. The first map covers everything just listed. The second map is "blowup" detail of the new Scurry County et al., reef oil fields, scene of the largest amount of new oil since East Texas, 20 years ago.

MIDDLE EAST

Trouble in Egypt

Jersey Standard calls a halt to oil search; Anglo-Egyptian, Socony-Vacuum ask change in rule barring foreign control

Dahl M. Duff

ALTHOUGH one major operator has withdrawn from further work in Egypt, there appears to be some hope for adjustment of the legal differences between the remaining two companies and the Egyptian Government.

Standard Oil Co. (N. J.) has notified the Egyptian Government that it is ceasing its oil-exploration activities, and it is now in the process of liquidating the physical assets of its local exploration subsidiary, Standard Oil Co. of Egypt.

The other two companies are Anglo-Egyptian Oilfields, Ltd. (Shell Group) and Socony-Vacuum Oil Co., Inc., the only commercial producers of crude oil in Egypt at the present time. Although existing Egyptian legislation is compelling a sharp curtailment in their exploratory work, these two companies are continuing discussions with the government to obtain a workable legal basis for their operations.

Principal objection to exploration by foreign companies in Egypt is contained in a provision of the Mining Law of 1947 which restricts future production leases to companies incorporated in Egypt and requires them to offer at least 51 per cent of their shares for subscription by Egyptian citizens.

The feature, involving minority ownership and loss of control of management, is flatly contrary to a fundamental principle adhered to by most oil companies operating in foreign areas. If the Shell organization and Socony-Vacuum are unable to obtain modification of the provision, it is understood they also will discontinue exploration and confine themselves to production from their existing fields.

Egyptian view.—The Egyptian Government is said to be well aware of the seriousness of the present impasse, and its officials are expected to make every effort to arrive at some workable plan for Anglo-Egyptian and Socony-Vacuum.

Egypt's proved reserves of crude oil are sufficient for only a few more years if the current high rate of consumption continues, and the failure to develop new reserves in the near future will lead to imports with a consequent drain on the country's limited resources of foreign exchange.

Abu Zeid Bey, director general of the liquid-fuels division of the Department of Mines and Quarries, is now in the United States for consultation with the interested oil companies, among other business. He has been invited by the Venezuelan Government to observe the oil industry and study the legislative and other incentives given to the industry in that country.

Background.—Standard Oil Co. of Egypt spent about $12,000,000 in exploration work in Egypt. It made its first discovery late in 1948 at Wadi el Feiran in the Sinai Peninsula 92 miles south of Suez. The well tested about 9 bbl. an hour, 23°-25°-gravity crude, through a ½-in. choke.

Prolonged negotiations with the government over acceptable lease terms followed. The government is said to have failed to carry out earlier assurances these would be forthcoming. The Jersey Standard company first announced suspension of its operations and since has withdrawn permanently.

General economic considerations also apparently entered into the decision of the Jersey company. It has no refining facilities in Egypt, and the quality and quantity of crude to be expected from the Egyptian discoveries are not considered competitive with Middle East oil, which will reach the Eastern Mediterranean in volume with the completion of the Trans-Arabian pipe line.

The situation.—In the present situation, both Anglo-Egyptian and Socony-Vacuum have submitted memoranda to the Egyptian Government summarizing the various handicaps which are faced in their exploration efforts and requesting that the government promptly appoint a committee to negotiate measures of relief.

As for the main obstacle, the provision for possible 51 per cent Egyptian control in the production phase, action by the Egyptian Parliament changing the law is necessary. The other differences are believed to be negotiable.

Egypt's position on export of crude has previously met with some criticism. This, however, is a reflection of the country's desire to obtain as large a degree of self-sufficiency in oil as possible. Domestic production is first required to satisfy domestic refineries, and free exchange from export is allowed the producing companies above what is required to meet oil import needs.

Field operations.—The three oil fields discovered in Egypt since the war have all been on the Sinai Peninsula. In this region, below the Thirty-First Parallel, Socony-Vacuum and Anglo-Egyptian share equally in joint operations. Sudr, discovered in 1946, now produces about 16,000 bbl. daily, and Asl, discovered in 1948, produces about 6,000 bbl. daily. These fields are on leases confirmed under the oil law. Between these fields is Ras Matarma where a lease is awaiting outcome of the discussions with the government. One rig each is at present being operated in Asl and Sudr, and a third is drilling in the exploratory block Nebwi, south of Asl.

Both companies have other exploratory blocks in Egypt, including some by Socony-Vacuum west of the Gulf of Suez. Whether the companies will explore these areas depends on the government.

A well is reported to have been brought in recently by Anglo-Egyptian at Hurghada field west of the Gulf of Suez. The well, reported to have averaged 350 bbl. daily through a ¾-in. choke over a period of 2 weeks, apparently represents efforts by the company to maintain production in this old area.

Hurghada was discovered in 1913 and last year had 43 pumping wells producing a total of about 900 bbl. daily. The other Egyptian field is Ras Gharib, operated by Anglo-Egyptian and still the major producing area with about 21,000 bbl. daily.

The difficulty of finding more fields in Egypt was emphasized in a recent discussion by J. Carr, chief geologist of Anglo-Egyptian, before the Mining and Petroleum Association of Egypt in Cairo. He said the average odds against further discoveries are about 20 to 1.

A tremendous amount of effort has been put into the search for oil in Egypt over the last 40 years, Carr said. At Ras Gharib, he said, success followed considerable preliminary survey work and that on two occasions wells were opened and then abandoned.

New company.—A recent development in the Egyptian oil industry was the organization of a privately owned Egyptian company, Soc. Nationale du Petrole d'Egypt (National Petroleum Co. of Egypt) which obtained exploration licenses on 104 blocks scattered throughout the country. Some of these offset, geographically, areas held by the major com-

panies. The head of this undertaking Torcum Papazian, recently was reported in the United States seeking support for the undertaking.

Kuwait Test Report

The second Kuwait - Saudi Arabia Neutral Zone test of American Independent Oil Co. and Pacific Western Oil Corp. this week was reported drilling at about 3,500 ft.

Earlier the well had encountered lost-circulation trouble and other difficulties.

The first Neutral Zone test was abandoned early in February at 5,020 ft. and the present location established farther west.

The well is being drilled by Kerr-McGee Oil Industries, Inc. and Brown Drilling Co.

CANADA

Refinery Project

Contracts let for Regina plant expansion program

CALGARY, Alta. — Contracts have been let by Saskatchewan Federated Co-Operatives, Ltd., for design and construction of facilities at its Regina, Sask., refinery, which will raise its capacity from 2,000 to 4,000 bbl. daily.

Costing approximately $1,500,000, the facilities will be in operation by the end of the year, and will be so designed as to increase capacity to 5,000 bbl. daily during 1951.

This is the fourth large Prairie Province oil - refinery construction program planned for the 1950-51 period. The other three, all slated for completion by the spring of 1951, are:

Imperial Oil, Ltd., Winnipeg refinery, to cost $10,000,000; capacity, 10,000 bbl. daily, including cracking capacity of 3,000 bbl. daily.

British American Oil Co., Ltd., Edmonton refinery, to cost $10,000,000; capacity 5,500 bbl. daily, including distillation and thermal cracking unit, coking unit, fluid catalyst cracking unit, and complete chemical-treating unit.

McColl-Frontenac Oil Co., Ltd., Edmonton refinery, to cost $10,000,000; capacity 5,500 bbl. daily, including catalytic cracking and coking units. Construction contract has been let to Foster Wheeler, Ltd., St. Catharines, Ont.

Saskatchewan Co - Op's contracts have been let to Born Engineering Co., of Tulsa, and Canadian Brown Steel Tank Co., Ltd., of Brandon, Man. These two firms designed and built the present Co-Op refinery at Regina.

The expansion calls for a thermal cracking plant, to be operated with the present plant as a single unit. To accommodate the additions, 70 acres have been added to Co-Op's present 55-acre site.

LATIN AMERICA

Levy to Advise Venezuela

Walter J. Levy, New York economic consultant and former head of the petroleum division of the Economic Cooperation Administration, has been appointed an adviser to the Venezuelan Government on evaluation of crude oil for royalty payments.

Producing companies in Venezuela have been negotiating with the government for a new formula for the calculation of royalty payments.

The prices which the companies pay for the royalty oil in the past have been the same as Texas crudes of similar quality with allowances for the different pipe-line charges and partially for the United States tariff.

The companies are reported to have asked the government for relief from this method and for a new formula to bring the royalty more in line with the current value of heavy Venezuela crudes. The contention is that proration in Texas has sustained the United States prices above the normal world market level.

Drop in Exploration

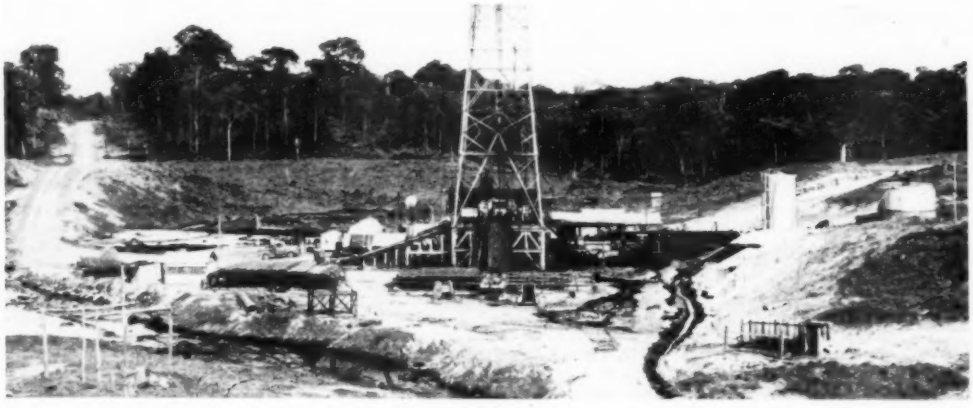
Forty-four geological and geophysical parties are listed as operating in Venezuela, among them one experimental telluric survey party.

The telluric party is working for the Shell organization in State of Zulia in Western Venezuela. It operates on the measurement of the intensity of earth currents.

The work with this new exploration technique is believed to be the first ever carried out in South America. Schlumberger Well Surveying Corp. is connected with the project.

The bulk of the remaining 43 parties in the field in Venezuela were geological groups. There were 23 of these, and 15 reflection seismograph parties. Figures are as of January, the latest available.

The total of 44 parties is a drop



DEEPEST FOREIGN WELL.—This is the Alturitas wildcat of Creole Petroleum Corp. 18 miles southeast of Machiques in the State of Zulia in western Venezuela. Last reported drilling at 17,032 ft., it is the deepest well ever drilled outside the United States. It is investigating the possibility of production from the Cretaceous limestone in the area west of Lake Maracaibo. Before drilling was begun, a road had to be built from Machiques to the site and a 250-acre tract cleared around the rig to discourage surprise attacks by the Motilon Indians of the region. At night floodlights are turned on around the clearing to illuminate it as a precaution against the Indians.

of 1 from the previous month and 4 from August 1949. The reduction in field exploration conforms to the downward trend of exploratory drilling in Venezuela.

Among the companies, Shell led in exploratory work as reflected by the number of parties working. Shell's total was 12, consisting of 5 geological, 4 seismograph, and 2 gravity meter, in addition to the telluric group.

Parties in the field are shown in the following table:

	January 1950	August 1949
Geological field parties	23	22
Structure drill parties	2	2
Gravity meter parties (land)	3	6
Seismograph parties (reflection)	15	18
Telluric survey party	1	0
Total	44	48

Shell Opens New Building

The new office building of the Shell organization in San Bernardino, a suburb of Caracas, Venezuela, was formally opened recently in dedication services attended by industry, government, diplomatic, and press representatives.

The new building will accommodate about 850 persons with the Shell companies who heretofore have been officed in various buildings in the Venezuelan capital.

Oil Trade Agreements

Petroleum products and equipment are involved in two trade agreements reported concluded recently in Latin America.

In Buenos Aires, it was reported that Yacimientos Petroliferos Fiscales, Argentine oil agency, had contracted to obtain 200,000 tons (about 1,400,000 bbl.) of crude from Peru. The Peruvian state oil agency signed for Peru. The arrangement was made under terms of the Argentine-Peruvian trade pact of last year.

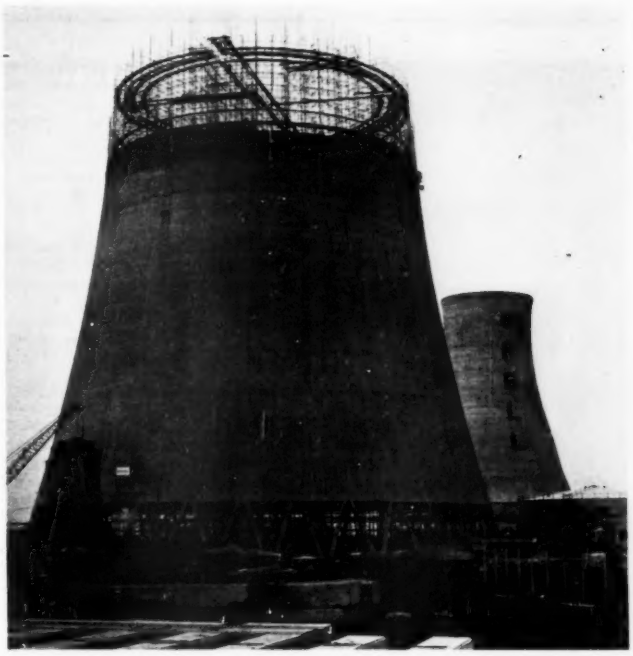
Rio de Janeiro reports said a Brazilian-Italian trade agreement was being signed there. In exchange for coffee and cotton, Brazil was to obtain manufactured goods and machinery, including equipment for a complete petroleum refinery of unspecified capacity.

AFRICA

Ethiopian Test Abandoned

Sinclair Petroleum Co. has abandoned its No. 1 Gumburo well in the Ogaden area of Ethiopia after reaching a depth of more than 10,000 ft.

Company officials stated that the geological data obtained has caused them to proceed with an extensive geophysical program and that geophysical operations will be augmented by surface geological studies and magnetometer survey.



WORLD'S TALLEST.—Now taking shape at Shell's new Stanlow refinery at Ellesmere Port, Cheshire, England, is this concrete cooling tower, which may be the world's tallest refining structure. When completed it will rise 341½ ft. above ground level, 33½ ft. taller than the new catalytic cracking unit of Sun Oil Co.'s Toledo refinery. (See The Oil and Gas Journal, April 13, page 56.) The cooling tower will handle 5,000,000 gal. of water an hour. It measures 272 ft. in diameter at the base, reducing to 168 ft. at the neck, and will widen to 177 ft. at the top. The completed structure will contain more than 500 tons of reinforcing steel, and the total weight of the tower will exceed 20,000 tons. A portion of the Stanlow refinery has been in operation since December and is handling about 25,000 bbl. of crude oil daily.

EUROPE

Rising Consumption

Marshall Plan countries expected to use 1,014,000 bbl. daily during next fiscal year; dollar spending dropping

WASHINGTON.—The Economic Cooperation Administration predicted last week that oil consumption in the Marshall plan countries, which averaged 856,000 bbl. daily in the fiscal year 1949 and is expected to amount to 942,000 bbl. daily this year, will reach some 1,014,000 bbl. per day during the year which begins next July 1.

Since the start of the European Recovery Program, procurement authorizations for oil have approximated $808,000,000, and $301,400,000 is earmarked for crude and products for the 1951 fiscal year. Of the total authorized up to March 1, last, $252,000,000 was spent in the United States, $256,000,000 in other Western Hemisphere countries and $300,000,000 in the Middle East; over 80 companies have participated in shipments, the ECA said.

More than half of the total authorizations for crude and products have gone to two countries, the United Kingdom receiving $250,000,000 and France $236,000,000. The Benelux countries have received $96,000,000 and Italy $72,000,000, and this group accounted for 81 per cent of the total.

Dollar outlay.—Although the volume of consumption and imports is increasing rapidly, ECA said, the dollar

(Continued on page 297)

PERSONALS

New Duties

Wilkins heads Gulf's transportation division

WILLIAM J. WILKINS has been named to head the transportation branch of production pipe-line department of Gulf Oil Corp., Pittsburgh. Concurrent with the appointment was the announcement that Wilkins has been elected a director of Interprovincial Pipe Line Co., which is building a 1,180-mile crude-oil pipe line from Redwater through Edmonton, Alta., to Superior, Wis.

Wilkins was born in Steubenville, Ohio, and graduated from University of Pittsburgh in 1926, with the degree of petroleum engineer. During vacations he worked for Marland Oil Co., and joined this company upon graduation, as assistant petroleum engineer at Ponca City, Okla. Later he was transferred to West Texas as division engineer. He joined the Gulf organization in 1929 as mechanical engineer and 10 years later was appointed chief engineer, Tulsa Pipe Line Division, Gulf Refining Co.

In 1948 Wilkins went to Kuwait, where he spent several months as executive assistant to the general manager of Kuwait Oil Co., Ltd., his duties consisting of work in general and pipe-line construction. Upon his return to the United States he went to Pittsburgh with Gulf Oil Corp.'s transportation department.

L. D. Hillyer, exploitation engineer, Houston division, Shell Oil Co., has been named production geologist, and transferred to the company's Houston area production department. Other changes in the company include: **F. D. Leigh,** mechanical engineer, East Texas division, production department, transferred to the Midland area; **W. A. Fletcher,** construction and maintenance foreman, East Texas division, named production foreman; **O. J. Shirley,** junior exploitation engineer, Houston, named exploitation engineer and transferred to Corpus Christi.

C. B. Porter, formerly division pipeline superintendent in charge of the Kentucky-West Virginia area of Tennessee Gas Transmission Co., has been transferred to the company's Houston office as pipe-line superintendent.

C. A. Mitchell, pipe-line supervisor, the California Co., New Orleans, has been transferred to Denver as western division construction engineer. Other changes include: **M. W. Wolf,** production department, Harvey, La., named district geologist, Plains States district, western division; **W. E. Hudson** named staff assistant to the superintendent of the western exploration division, Denver; **H. W. Addington,** petroleum-engineering division, New Orleans, transferred to Denver; **R. M. Campbell,** exploration geology staff, New Orleans, transferred to Harvey; **W. W. Houck,** southern exploration division, Monroe, La., transferred to Lexington, Ky.; **O. M. Ralph,** producing department, Denver, transferred to Harvey, La.

Henry L. Phillips, president of Sinclair Oil & Gas Co., has been elected a director of the National Bank of Tulsa. Phillips, with the Sinclair organization since 1916, is a member of the board of directors of Sinclair Oil Corp. and chairman of the board of Venezuelan Petroleum Co.

Jack Cullinan has been appointed assistant to the vice president of American Republics Corp., Houston. He was formerly manager of the land division. **J. W. Wingfield** will replace Cullinan as land division manager. Other changes include: **L. B. Howard, Jr.,** assistant chief petroleum engineer, Houston, named chief petroleum engineer; **Bennett B. Anderson,** landman at Artesia, N. M., transferred to Houston as district landman in charge of the newly created Houston-Beaumont division; **Forrest S. Crockett,** formerly landman and scout, Shreveport, transferred to Houston as assistant manager of the land division; **G. C. Barton,** scout at San Angelo, named to replace Crockett at Shreveport; **Martin A. O'Brien,** scout at San Antonio, named to replace Barton; **Alva C. Keith** named scout at San Antonio; and **Joe Lodle** named scout at Artesia, N. M.

Walter B. Pyron, vice president of Gulf Oil Corp. for foreign production and a director of Kuwait Oil Co., Ltd., has been decorated by the Mexican Government with its Military Merit Medal of the First Class in recognition of his work during World War II in strengthening friendship and understanding between the United States and Mexico. Pyron, a retired Regular Army brigadier general, has been Gulf's representative in London for the last several years.

L. W. Storms, member of the production department of Creole Petroleum Corp. in Caracas, Venezuela, has been transferred to Caripito in eastern Venezuela to be assistant division manager of the eastern division.

C. S. Mitchell, Bartlesville, Okla., manager of crude-oil supply and transportation for Cities Service Oil Co., has been elected to the board of directors of Cities Service Pipe Line Co. Mitchell joined the company as junior engineer in 1930 after graduation from North Carolina State University's School of Engineering. After serving in the gas-production and transmission fields, he was moved to Bartlesville in 1939 as a member of the purchasing department. He recently was elected to the directorate of Texas-Empire Pipe Line Co., Kaw Pipe Line Co., and Texas-New Mexico Pipe Line Co.

J. Dave Sterling has been elected president of Sunset Oil Co., Los Angeles. He also is head of Eagle Oil & Refining Co., Inc.

J. P. Bristow has resigned his position as vice president of the Tennessee Gas Transmission Co., and opened the firm J. P. Bristow & Co. in Houston. He will serve as a consulting engineer on pipe-line construction and related fields.

Harold L. Geiss, formerly Gulf Coast division geologist for Barnsdall Oil Co., Houston, has joined R. B. Mitchell Co., a consulting petroleum geologist and engineering firm in Houston.

A. E. Alexander, formerly associated with Standard Oil Co. of Texas and the California Co., New Orleans, has been appointed manager of the newly instituted oil and gas department of the Hibernia National Bank, New Orleans.

C. E. Olmsted, vice president and director of The Texas Co., has been elected a director of the American Standards Association. A member of American Petroleum Institute, Olmsted has been in close touch with extensive standardization of equipment, production practice, and test methods used by the oil industry. He was with Texaco for 15 years in Los Angeles before transferring to New York City.

Walter Davidson, Houston, has been appointed superintendent of construction for Transcontinental Gas Pipe Line Corp. He was formerly with Fish Constructors, Inc., Houston.

Richard E. Lauterbach has been named assistant manager of General Petroleum Corp.'s Torrance, Calif., refinery, and **Paul Sanders** has been named refinery general superintendent. Lauterbach joined the company in 1936 as a laboratory assistant, became a chemical engineer in 1939, and was named refinery engineer in 1945. Sanders is a veteran of 31 years of service with the company, and has been refinery superintendent since 1945.

L. A. Cranson, executive vice president and director of Honolulu Oil Corp., San Francisco, has been reelected president of Oil Producers Agency of California. Other officers who will serve during the year, and who were all reelected, include: **H. E. Woodworth,** Safe Oil Co., Bakersfield; **R. A. Grant,** Fullerton Oil Co., Pasadena; **W. H. Geis,** petroleum engineer, Los Angeles; and **C. A. Johnson,** Holly Oil Co., Los Angeles, vice presidents; **Rush M. Blodget,** executive vice president; **W. A. Russell,** Seaboard Oil Co., Los Angeles, secretary-treasurer; and **Verne Harrell,** Bankline Oil Co., Los Angeles, assistant secretary-treasurer.

Dr. G. W. Govier, professor of petroleum engineering at the University of Alberta, Edmonton, has been elected chairman of the petroleum and natural-gas division of Canadian Institute of Mining and Metallurgy. Others elected include: **John R. McKay,** district petroleum engineer for British American Oil Co., Ltd., Calgary, vice chairman; and **Dr. Jack Gregg,** associate professor of petroleum engineering at the University of Alberta, secretary. The following were elected to the executive committee: **J. W. Young,** Imperial Oil, Ltd.; **Ken Doxe,** Central Leduc Oils, Ltd.; **D. L. Redman,** California Standard, Ltd.; **J. D. Gustafson,** Imperial Oil, Ltd.; **Jack Keith,** Valley Pipe Line Co.; **Vernon Taylor,** Imperial Oil, Ltd.; **Dr. J. O. G. Sanderson,** consulting geologist; **W. B. Dingle,** Imperial Oil, Ltd.; **H. M. Hunter,** Canadian Western Natural Gas Co.; **Dr. R. E. Folinsbee,** University of Alberta; **Dr. G. M. Furnival,** California Standard Co.; and **W. D. C. MacKenzie,** Imperial Oil, Ltd.

Anthony E. L. Morris has been appointed West Coast division geologist for D. D. Feldman Oil & Gas Co., Los Angeles. Morris formerly was geologist for General Petroleum Corp. in Bakersfield.

William R. Boyd, Jr., Teague, Tex., formerly president of American Petroleum Institute, has formed the consulting firm of Boyd, Hardey & Wheelock with **B. A. Hardey,** Shreveport, and **R. L. Wheelock,** Corsicana, Tex., with headquarters in Teague. Boyd will serve as managing partner. Both Hardey and Wheelock are independent oil producers.

Harry T. Klein, president of The Texas Co. since April 1944, received the honorary degree of doctor of commercial science recently from New York University. Klein, a lieutenant colonel in World War 1, who joined Texaco in 1921 as assistant general counsel, was one of 50 business and financial leaders presented with honorary degrees by the university.

Theodore Rinehart, attorney of Tulsa, has been elected a director of the Texas Illinois Natural Gas Pipe Co. which will construct a 30-in. pipe line from Corpus Christi, Tex., to Chicago. Rinehart was active in the formation of the Gulfcoast Northern

ROCKY MOUNTAIN A.P.I. OFFICERS.—Newly elected officers of the Rocky Mountain District, A.P.I., division of production, are: C. H. Griffin, Phillips Petroleum Co., Casper, vice chairman for Wyoming; A. E. Campbell, Seaboard Oil Corp., Casper, secretary-treasurer; W. P. Tallant, Union Oil Co. of California, Denver, vice chairman for Colorado; D. T. Hoenshell, General Petroleum Corp., Casper, vice chairman at large. Rex Davis, Cut Bank, Mont., vice chairman for Montana, was not present when the photograph was taken. *See story on page 137 of this issue.*

PERSONALS

Gas Co., which, with the Peoples Gas Light & Coke Co., owns the recently organized Texas Illinois Natural Gas Pipe Line Co.

J. M. Milan, lease foreman at Holliday, Tex., for Phillips Petroleum Co., has been transferred to Snyder, Tex., as lease foreman.

Leo E. Hines, reservoir-production engineer at Natchez, Miss., for the California Co., has been transferred to the Lake St. John field as petroleum engineer.

Baird F. Bottenfield, process engineer for Petrol Refining, Inc., Texas City, Tex., has joined the Oak Ridge National Laboratory at Oak Ridge, Tenn., as senior development engineer.

D. W. Smith, production foreman at Holyrood, Kans., for Sohio Petroleum Co., has been transferred to Russell, Kans., as assistant district superintendent.

Joseph R. Clair, Wichita district geologist for Great Lakes Carbon Corp., has resigned to become manager of the Denver Sample Log Service, Denver.

John A. Brineman, geologist for Socony-Vacuum Oil Co., Inc., in Colombia, has been transferred to the Magnolia Petroleum Co. organization in Dallas.

O. B. Rylander, formerly division manager for Socony-Vacuum Oil Co. of Venezuela in the Barinas area of western Venezuela, is now in New Guinea on loan to Standard-Vacuum Oil Co. He will assist in the drilling program now being carried on in Papua by Australasian Petroleum Co., Pty., Ltd.

Kenneth C. Vaughan has been named superintendent in charge of drilling and production for the Valley division of Union Oil Co. of California, with headquarters at Bakersfield, Calif., replacing **R. A. McGoey,** who resigned to open offices as a consulting petroleum engineer. Other changes include: **J. Talbert Ledbetter,** named acting superintendent in charge of drilling and production for the southern division, replacing Vaughan; **Carl A. Steiner,** appointed Valley division petroleum engineer; **Charles F. Bowden,** named to replace Steiner as division petroleum engineer at Dominguez, Calif.; and **J. Christopher Rector,** appointed assistant to the manager of Pacific Coast field operations, with headquarters in Bakersfield.

H. Robert Sells, reservoir engineer for Sohio Petroleum Co. at Oklahoma City, has resigned to join the firm of Amstutz & Yates, Inc., consulting engineers at Wichita.

R. S. Lamon, geologist for Richmond Petroleum Co. in Colombia, has been transferred to San Francisco.

U. Haanstra, paleontologist for Cia. de Petroleo Shell de Colombia, has left Colombia and will return to Europe.

Addison S. Cate, geologist for Shell Oil Co. at Long Beach, Calif., has been transferred in that capacity to the company's Ventura, Calif., office. Other changes include: **James L. Cowell,** micropaleontologist at Long Beach, transferred to Ventura; **Lloyd W. Crabill,** laboratory assistant at Long Beach, named laboratory analyst at Ventura; **Albert C. Eckerle,** seismograph operator in the Wyoming area, moved to the Los Angeles division; **Donald W. Gresser,** geologist at Los Angeles, transferred to Ventura in that capacity; **James D. Moore,** micropaleontologist at Long Beach, transferred to Ventura; **Donald L. Jacobsen,** engineer at Los Angeles, named mechanical engineer; **George S. Kukuchek,** engineer at Los Angeles, transferred to Bakersfield as mechanical engineer; **Kurt F. Pilgram,** exploitation engineer at Long Beach, transferred to Houston in that capacity; and **John A. Pryor,** engineer at Los Angeles, named mechanical engineer at Ventura.

SHIFTS

Whit Y. Mauzy, Jr., engineer, Stanolind Oil & Gas Co., North Cowden to Midland, Tex.; **L. A. Shutt,** superintendent, Phillips Petroleum Co., Uvalde to Del Rio, Tex.; **C. M. Ford,** superintendent, Standard & Fryer Drilling Co., Vaskti to Bowie, Tex.; **W. C. Guess,** Sun Oil Co., Bay City, Tex., to Galveston; **Joe Lee Terry,** geologist, Houston Oil Co., Houston to San Antonio; **Eddie J. Hudson,** engineer, Atlantic Refining Co., Odessa, Tex., to Dallas; **J. M. Sterritt,** superintendent, Skelly Oil Co., Tyler, Tex., to Shreveport; **C. L. Sparkman,** superintendent, Humble Oil & Refining Co., Grand Isle, La., to Prentiss, Miss.; **John E. Yerger,** engineer, Lake Charles to Opelousas, La.

L. J. Meyer, geologist, DeGolyer & MacNaughton, Houston to Dallas; **Leland H. Miller,** engineer, Gulf Oil Corp., Columbus, Tex., to Houston; **Lewis S. Murphy,** engineer, Davis Mud Sales, Dallas to Marshall, Tex.; **J. T. Payton,** engineer, The Texas Co., El Campo to West Columbia, Tex.; **James E. Fox, Jr.,** engineer, Stanolind Oil & Gas Co., Fort Worth to Brownfield, Tex.; **J. M. Milam,** geologist, Phillips Petroleum Co., Sweetwater to Snyder, Tex.; **A. L. George,** engineer, Humble Oil & Refining Co., Crowley, La., to New Orleans; **J. T. Morriss,** superintendent, Tennessee Gas Transmission Co., Zanesville, Ohio, to New Castle, Pa.

R. W. Killen, superintendent, the California Co., Salt Lake City to Denver; **W. K. Barry,** engineer, Superior Oil Co., Enid to Chickasha, Okla.; **Frederick V. Miles,** engineer, Gulf Oil Corp., Seminole, Okla., to Hobbs, N. M.; **C. G. Horn,** superintendent, Rocky Mountain Drilling Co., Gardenia to Los Alamitos, Calif.; **Robert R. Larson,** engineer, Marcoil Corp., Los Angeles to Oxnard, Calif.; **Harold T. Olsen,** engineer, Superior Oil Co., Pasadena, Calif., to Oklahoma City.

Orven H. Armstrong, Magnolia Petroleum Co., Lamesa, Tex., to Aztec, N. M.; **John H. Wishnick,** engineer, Continental Carbon Co., Amarillo to Houston; **W. E. Stack,** geologist, Texas Gulf Sulphur Co., Corpus Christi to Pasadena, Tex.; **Louis Franklin,** engineer, Compania Del Agua Del Mariscal C. A., Houston to Guatemala City; **W. H. Crowe,** engineer, Humble Oil & Refining Co., Overton to Tyler, Tex.; **J. A. Moore,** engineer, Continental Oil Co., Wichita Falls, Tex., to Ponca City, Okla.

DEATHS

Harry Oliver Rea, 70, drilling contractor, died at Bedford, Va., April 4. A native of Butler County, Pennsylvania, Rea was well known in West Virginia, Texas, and Wyoming oil areas.

Mills Bennett, 67, Houston oil operator, died April 14.

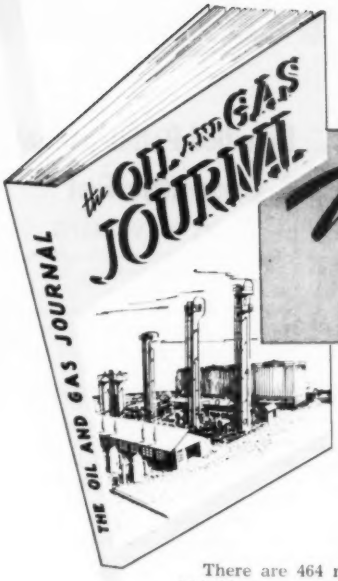
John S. McCampbell, 55, Goliad, Tex., oil man, died April 12.

David W. Sellery, 54, Casper division land man for Ohio Oil Co., died April 9. He had been with the company since 1925.

Joseph M. Monaghan, 57, retired secretary and assistant treasurer for Humble Pipe Line Co., died April 7 at Houston.

Bryan B. Talbot, 64, superintendent of the machine shops for The Texas Co., died April 6 in Port Arthur, Tex.

Ray E. Key, 27, Albany, Tex., oil producer, died in Abilene, Tex., April 14.



Natural-Gasoline and Cycling Number

DID YOU KNOW THAT . . .

There are 464 natural-gasoline plants in this country with a total capacity of 22,262,650 gal. daily.

Cycling plants number 52 with a capacity of 7,251,800 gal. daily.

Total number of plants decreased 50 per cent in the past 20 years but capacity has almost tripled.

Plant output of all products in January was 20,407,000 gal. daily or almost 9 per cent of total liquid hydrocarbon production for the month.

Texas accounted for 50.6 per cent of total natural-gasoline and cycling-plant production in January.

In January, plant production of liquid petroleum gas, totaling 8,599,000 gal. daily, was greater than natural-gasoline production for the first time.

Finished motor-fuel production at natural-gasoline and cycling plants averaged 52,000 bbl. daily in December and January, up 31 per cent from a year ago.

AND THAT . . .

The many advancements in processing methods, equipment, and refinements in the industry's new natural-gasoline and cycling plants include:

Centrifugal compressors installed for field processing.

High-boiling-point heat-transfer medium, for fractionator reboiler and other services.

Rich-oil stabilization and similar processing methods improve over-all plant performance.

Scarce or hard-water problem solved by aerial cooling.

Refrigerated absorption service now provided without contamination problems.

Hundreds of improved equipment items from block valves on the raw-gas inlet through control instruments to product storage vessels make today's natural-gas processing plant one of the industry's most efficient operations.

Highlights on modern gas-processing-plant design incorporating advanced equipment and methods are discussed in this section.

READ THE DETAILS IN THIS SPECIAL SECTION ⟶

NATURAL-GASOLINE INDUSTRY'S LEADERS

Appraise its Problems and

Here a representative group of executives identified with all phases of natural-gasoline manufacture, cycling, and associated activities analyze present-day conditions in their rapidly expanding industry and project future trends.

Three Factors in Today's Operation

BY J. A. LA FORTUNE

Executive vice president, Warren Petroleum Corp., Tulsa

THE current disturbing situation in the natural-gasoline industry appears to me to be due primarily to (1) oversupply of crude oil and natural gasoline, (2) loss or lack of exports, and (3) a substantial increase in catalytic cracking capacity at refineries.

The oversupply can be corrected, to some extent, by official and equitable proration in all producing states and by a reduction of imports. The proration of crude-oil production automatically regulates the production of natural gasoline. Cycling or condensate plants also should be included in an equitable proration based on market demand.

The devaluation of the pound sterling and the British attitude with reference to "dollars for oil" makes the possible resumption of exports very doubtful. Approximately 200,000 bbl. of stabilized natural gasoline were being exported monthly until January 1, this year. Since that time no export purchases of any consequence have been made. At this time, with the Texas price of Grade 26-70 in the field at 3.5 cents per gallon, the purchase of natural gasoline for export certainly offers a great inducement from the profit angle.

Catalytic processes installed in virtually all refineries today in many cases provide the refiner with a large volume of light ends, which formerly were obtained in the open market through purchases of natural gasoline.

Natural gasoline will continue to be manufactured and the product will continue to find a market, primarily through the refiner, either through tank-car shipments or crude-pipe-line deliveries, because it is and always will be a valuable component of motor fuel.

Liquefied Petroleum Gas as A Competitive Fuel

BY W. V. VIETTI

Manager, gas division, The Texas Co., Houston

THE recent conservation effort by regulatory bodies to conserve waste gas, an admirable and forward-looking step, has resulted in additional fuel supplies from two sources. Residue gas from oil-well gas, formerly flared, is now being sold in large quantities. Butane and propane production has been greatly increased by the plants handling additional oil-well gas.

These fuels compete with each other, with dry natural gas, heating oils, coal, nonpetroleum fuels, and with electric power for power, cooking, heating, and refrigeration. The present weakness of liquefied petroleum gas markets is a natural result of the recently increased supply of this material. Oil-well residue gas has been given preference over gas-well gas. Enormous quantities of liquefied petroleum gas have been replaced by residue and natural gas, oil-burning heaters have replaced coal, etc. Normal growth of population alone will not absorb excess liquefied petroleum gas in the near future. Seasonal variations in demands for heating necessitate additional summertime markets. Uses for motor and tractor fuel, tobacco

J. A. LA FORTUNE

W. V. VIETTI

W. A. BADEN

JOHN T. OXLEY

Suggest Remedial Measures

curing, dehydration of grains, and other previously unexplored heat and fuel loads are increasing, and additional markets are being developed. Reformation of butanes into motor fuels at refineries and higher vapor pressures in motor gasoline would in turn increase the demand for propane in liquefied petroleum gas.

It is felt that there is no pessimism in the long-range viewpoint. The progressive steps briefly outlined above and others being tried out should shortly bring supply and demand for lighter hydrocarbons into better balance. The oil industry has alternately been faced with feast and famine conditions, has never failed to set its own house in order within a reasonable time and has, in its liquefied petroleum gas production, an ample supply of a unique and highly desirable fuel which has a permanent place in our economy.

Underground Storage Would Solve Difficulties

BY C. R. WILLIAMS

Vice president, The Chicago Corp., Corpus Christi, Tex.

THE problem of the gravest concern to the light-hydrocarbons industry is that of achieving the desired balance between supply and demand in propane and butane. Due to the combined effects of interstate gas pipe-line sales, and the requirement of state regulatory bodies to conserve casing-head gas, producing facilities for liquefied petroleum gas materials have been installed at a greatly accelerated rate.

The result has been that the supply has risen much more rapidly than the demand. This unfortunate situation, however, is really only apparent during the warm season. It is reasonable to believe that within a year or so, demand for L.P.G. will increase to the point where there will actually be shortages in winter. Unless steps are taken to level off the seasonal supply demand fluctuation, the industry will continue to suffer.

The writer believes the unfavorable situation could be eliminated entirely by the use of storage, and that the most economical means of obtaining this storage is by underground reservoir, using salt-water sands. The surplus production in any given period can then be stored in natural underground reservoirs and be reproduced without further processing, other than removal of water, at the period of high demand.

Several of these projects have now been completed and are past the experimental stage, giving proof that this method requires considerably less capital investment per barrel of storage than pressure storage installed aboveground. When sufficient underground storage has been developed, the industry will overcome economic handicap.

Solution for Balancing Supply and Demand

BY JOHN T. OXLEY

President, Texas Natural Gasoline Corp., Tulsa

NATURAL gasoline and butanes are today selling below $1.40 per barrel as compared to the crude-oil selling price of $2.65 per barrel. No economic justification exists for such a wide difference in prices since it is possible for every gallon of these volatile products to end up in the refinery motor-fuel stream, whereas only approximately 43 per cent of each barrel of crude (costing far more per barrel) is produced as motor gasoline.

The failure of the management of the refinery branch of the industry to realize the value of natural gasoline and butanes is disquieting because the production of these volatiles, including propane and all liquefied petroleum gas flared, now amounts to approximately 10 per cent of the current crude oil production as against 4 per cent in 1939. If crude-oil purchasing companies would give consideration to this large volume of volatiles when making crude-oil nominations to the conservation authorities, the first step would be taken toward balancing current supply and demand.

A basic solution to the problem would then be simple. Indeed, one major company has already pointed the way. This company is purchasing

JOHN A. LYNCH

C. R. WILLIAMS

F. E. RICE

J. H. FORRESTER

all the natural gasoline and a considerable portion of the butanes available from plants operating in fields where the company is purchasing crude oil, and is delivering these products through its pipe lines to refineries, leaving an equal quantity of crude oil in the reservoir for future use or purchase. If other companies would adopt this policy, the result would be a true conservation of volatiles such as natural gasoline and butanes, of which a considerable quantity of the latter is now being flared or burned in the field; and at the same time an end would be brought to the disparity between supply and demand from which the natural-gasoline industry is at present suffering. This policy, perhaps, would increase the vapor pressure of finished motor fuels by a fraction of a pound but, by field tests, this has proven practical. Very likely, too, this basic solution would put an end to certain unhealthy current practices in marketing butanes and propane.

Many plants face abandonment or shutdown in the near future unless conditions are quickly alleviated. Distributors, dealers, and the public are losing confidence in the industry. Time is short! Constructive leadership toward a basic solution for the industry, so sorely needed, must be forthcoming soon; for if the present chaos continues, the industry faces increasing loss of valuable hydrocarbons and the consequent threat of further regulation.

Industry Indispensable to Conservation Movement

BY JOHN F. LYNCH

President, La Gloria Corp., Corpus Christi, Tex.

SINCE 1902 when the first natural-gasoline plant was constructed, the natural-gasoline industry has played an important role in the conservation of oil and gas. During the last 5 years the natural-gasoline industry has become indispensable to the entire conservation movement.

Since the war, 130 gasoline plants, costing approximately $200,000,000, have been installed, and as a consequence of these installations, the waste due to flaring casing-head gas has been reduced to the lowest possible minimum. At the present time casing-head gas, which was vented a few years ago, is being gathered and processed and the residue therefrom is either sold to the fuel market or returned to the oil-producing horizon. In Texas these plants are now utilizing approximately 2 billion feet of gas per day, which in the absence of the natural-gasoline plant would either be vented to the air or shut in to prevent waste.

The revenue derived from natural gasoline taken from casing-head gas has also made pressure maintenance and pressure restoration possible in numerous oil fields. Unquestionably, these operations will result in production of millions of barrels of oil that would otherwise remain in the reservoir. Many oil fields in Texas would be shut in today if it were not for the utilization of casing-head gas which has been made possible by the gasoline plant.

The Railroad Commission of Texas has in numerous instances permitted production from condensate reservoirs where the reservoir pressure in such reservoirs was maintained by returning the residue gas. The revenue derived from the natural gasoline has kept these reservoirs from either remaining dormant or being lost by the lessees. The gasoline revenue has enabled the owners of these reservoirs to retain them by cycling operations which have prevented retrograde loss that would have necessarily ensued when the reservoir pressure was reduced by withdrawals.

It is amazing to find that the market for products recovered from natural gas is now in an unstable and chaotic condition. Many operators think the present conditions are largely due to the importation of petroleum products. These operators believe that it will be far better to reduce imports or further reduce the domestic production of oil rather than destroy the natural-gas industry and also bring about a shutdown of oil fields that are now operating solely because the gasoline plants take care of the casing-head gas. They also think that the natural-gasoline industry should be given more consideration than it is now getting because of the assistance they are giving to pressure maintenance and secondary recovery in oil fields.

The vast majority of operators realize that if the economics of the natural-gasoline industry continues in the present unstable condition, the usefulness of this efficient means of conservation will be destroyed and as a result, large quantities of liquid hydrocarbons will be lost and many oil-producing reservoirs will be closed in by the conservation authorities.

New Problems Have Accompanied Expansion

BY W. A. BADEN

President, Anchor Petroleum Co., Tulsa

THE liquefied-petroleum-gas industry has made great strides and much progress in the last 10 years, but, while taking these strides, it has encountered many problems.

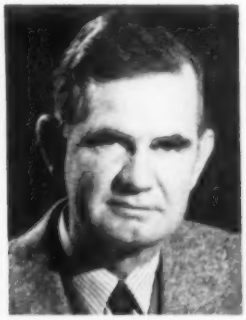
As for progress, the L.P.G. industry has greatly increased storage and shipping facilities, it has expanded the use of L.P.G. through consumer education, the source of supply is greater, and an all-important line of appliances designed and marketed for L.P.G. use have been developed.

This progress in the industry has caused many headaches, however. For instance, the increased source of supply has increased the demand for storage facilities and, while much has been done along this line, storage facilities are still inadequate.

The greatest problem the L.P.G. industry faces today is that of the valley and peak season of L.P.G. consumption. The summer months find marketers and producers working frantically trying to secure the permission of their customers to make shipments. The winter months find the picture reversed—the customers can't be supplied enough . . . fast enough. There are two ways this problem can be counteracted.

1. Establish increased

OTHA M. GRIMES



J. W. VAIDEN

A. H. WEIL

storage at points of consumption.

2. Develop new uses for L.P.G. during the off season.

When this comes about, the industry will have a balanced load which will be extremely beneficial for all concerned—we will have a more stabilized market and more-or-less equalized prices the year 'round.

I feel certain that, ultimately, most of these problems will be worked out to the advantage of all. Marketing L.P.G. is still a relatively young industry; however, I believe we can look forward to the years ahead with the assurance that our business will continue its history of expansion and prosperity.

Problems Those of Entire Petroleum Industry

BY F. E. RICE

Vice president, Phillips Petroleum Co., Bartlesville, Okla.

QUITE frequently we are asked what are the economic problems of the natural-gasoline industry. This is a "natural" question. In reality, however, there are not many problems peculiar to this business alone. The problems of natural gasoline are basically those of the petroleum industry as a whole. What is good for the one favors the other. Natural gasoline, after all, is motor fuel, constituting about 10 per cent of the total output of such fuel from all sources. Generally speaking, it can be produced at a lower unit cost than motor fuels made from crude oil.

Often in the past, with the advent of some radical change in oil-refining processes, many have predicted the passing of the natural-gasoline industry. Widespread pressure-still crude cracking at one time promised to produce so much volatility that natural was doomed. Later advances brought catalytic cracking which threatened to rob natural of its antiknock advantage. As liquefied petroleum gases grew in value, refinery L.P.G. production made inroads into natural's prior private bailiwick. None of these developments has produced the calamitous results predicted by pessimistic prophets. The fact remains that the natural-gasoline industry has gone right on at the old stand, improving its methods, bettering its product by skillfully segregating and combining the choice natural components and derivatives, consolidating its gains, and increasing its production as opportunity offered.

So far as can now be seen, crude-oil refining and natural-gasoline production will go right on hand in hand, sometimes independently but most times together, jointly serving the ever-increasing needs of the public for petroleum products.

Profit in Hydrogen Sulfide Conversion

BY J. H. FORRESTER

Manager, natural-gasoline department, Stanolind Oil & Gas Co., Tulsa

THREE significant trends of the natural-gasoline industry are the underground storage of surplus liquefied petroleum gas, the upgrading of cycling-plant gasoline octane number at central plants, and the manufacture of sulfur at gasoline plants processing sour gas.

Wide seasonal fluctuations in demand perennially plague the L.P.G. manufacturer. Postwar construction has added to the problem by pushing production ahead of demand. Demand will continue to increase and should gain upon supply now that construction is leveling; efforts of the Natural Gasoline Association of America, the Liquefied Petroleum Gas Association, the Gas Appliance Manufacturers Association, and others will be notable in promoting the use of L.P.G. Underground storage to conserve surplus production until needed can become an important means of balance.

Advancing octane numbers of first-line gasolines under pressure of the current vigorous quality competition is forcing cycling-plant gasoline to less-attractive markets. Processing to upgrade octane number is expected to find further application. Gathering the gasoline to strategically located central plants for such processing will help cut unit costs.

Natural-gasoline manufacturers will not overlook the profit possibilities of converting hydrogen sulfide scrubbed from sour gas into sulfur. With a foreseeable end to low-working-cost deposits of natural sulfur, there is active interest in any large-quantity hydrogen sulfide stream. Further process improvements are expected to decrease both investment and operating costs so that sulfur recovery may be extended to smaller plants.

H. W. MANLEY

H. W. CLUTE

Automotive Designers Can Aid in Conservation

BY JAMES W. VAIDEN

Vice president, Skelly Oil Co., Tulsa

SINCE about 1931 the octane levels of gasoline have climbed steadily. Natural gasoline, having a leaded octane exceeding the prewar finished motor-fuel octanes and possessing an exceptionally high response to the addition of tetraethyl lead, was attractive to the refiner as a gasoline blending stock. This use of natural gasoline in motor fuel has been of considerable economic advantage to the petroleum industry and to the nation as a whole in utilization of natural resources.

Now, the higher-compression engine has caused an increase in the octane requirements of gasoline to the point where the lead susceptibility of natural gasoline no longer affords the same advantage in octane improvement as at prewar levels. This continuing trend toward higher-compression engines is limiting the ability of the refiner to utilize natural gasoline. If automotive fuel pumps and plumbing systems were further developed to allow the use of higher-vapor-pressure gasolines, more natural gasoline of higher vapor pressure could be included, even at today's octanes, in motor fuel.

The higher-vapor-pressure natural gasolines so utilized would tend to restore the previous relationship between natural-gasoline octane and finished motor-fuel octane, thus making the blending of natural gaso-

line again attractive to the refiner. The petroleum industry is continuing research efforts to secure more knowledge about fuel combustion in piston engines and the cause of gasoline knock. Conservation of our natural resources dictates that the answer to the economic use of natural gasoline in today's motor gasoline must be forthcoming in the near future.

Experimentation Conducted On Underground Storage

BY H. W. MANLEY

Vice president, Barnsdall Oil Co., Tulsa

THE subject matter of this statement relates to the storage of L.P.G. products. There is a concerted effort at the present time among producers in the industry to enlarge the scope of L.P.G. sales. On the other hand, as one natural gasoline-L.P.G. producer, Barnsdall Oil Co. is constantly faced with the problem of summer versus winter demand for L.P.G. products.

During the past year Barnsdall has conducted experiments at its Benton cycling plant for the storage of L.P.G. products during the low-demand season in the Bodcaw sand. During the off-season demand for 1949, we stored a total of approximately 95,000 bbl. of this type product. During the 1949 and 1950 demand season for L.P.G. products, we recovered approximately 55,000 bbl. of products from this storage in the reservoir for sale to our customers. This storage program, as a result, has served two purposes: (1) We had L.P.G. products for our customers during the demand season; (2) the storage of the L.P.G. products was a 100 per cent conservation program, since we did not have to burn these products during the off-demand season, as has been the practice in the industry for a number of years.

The Chicago Corp. and a number of other companies have followed the same procedure as has been practiced by Barnsdall during off-season demand for 1949 for L.P.G. products. It would appear that an effort by all producers to follow this practice would accomplish the two above-mentioned objectives for the industry as compared to conventional-type tank storage at a cost of about $10 per barrel. In other words, using Benton as an example, we would have had an expenditure of approximately $950,000 at $10 per barrel on tank storage to take care of our 95,000 bbl. of products that we stored in the ground last summer. A well in this field costs approximately $100,000. We will have the use of this well as a storage facility over a period of the next 10 years.

In view of the above facts, it is easy to note the economics of this production and conservation practice, and should make a point for consideration by the management of all companies.

Industry Needs Young Technically Trained Men

BY OTHA H. GRIMES

Natural Gasoline Manufacturer, Tulsa

SOME time after the end of the late war this publication carried an editorial "Passing of Flares." The prophecy in that editorial has come to pass. Conservation laws and efficient production methods have seen to that. In the main, gas produced today as a byproduct of oil production is not dissipated or flared but is processed. The gas is compressed, the liquid fractions are extracted, the remaining gas is dehydrated or sweetened if necessary, and the gas is then sold or returned to the formation.

One attending any convention of the Natural Gasoline Association of America cannot escape being impressed by the number of young men engaged in the natural-gasoline industry. In the passing of flares has come great opportunities for these young men. They are needed in organizations, large and small, for their technical knowledge. On the other hand, in no other line of endeavor is it more readily possible for a man with relative safety to capital to enter business for himself. Many manufacturers now supply skid-mounted compressor units of various capacities, dehydration units, hydrogen-sulfide-removal units, and even skid-mounted gasoline plants to provide for the utilization of small volumes of gas with high salvage of invested capital. Rapid erection, flexibility of operation, and predetermined efficiency are possible. Thus, conservation has broadened rather than limited opportunities for personal endeavor in this branch of the petroleum industry.

Industry Should Seek to Broaden Uses of Products

BY H. W. CLUTE

President, Universal Petroleum Co., Tulsa

IN our search for profitable markets for goods and services it is of primary consideration that the inherent responsibilities should be recognized and accepted by those individuals or concerns seeking outlets for their production.

Specifically as concerns the liquefied-petroleum-gas section of the natural-gasoline industry our present inadequacy of utilization suggests the urgency of an immediate decision as to the extent of obligation we are willing to assume to encourage the most rapid expansion of usage.

Any producer of liquefied-petroleum gases who is free and willing to make a 5-year dedication as to quantities and values can effect a complete economic disposition of his products within a 2-year period. Furthermore, if properly planned in advance all the involved expense can be self-liquidating during this same period. Also, by strict adherence to a correct preconceived procedure the rate of delivery from points of production can be brought to a level approximating daily production.

Not the End Of the Road

BY A. H. WEIL

General superintendent, natural-gasoline department, United Gas Pipe Line Co., Shreveport

IT would seem that volatility, the very essence of the natural-gasoline business, is becoming an unwanted child. Nearly all of the modern processes for manufacturing research-octane gasoline have the characteristic of creating additional volatility and this has had a depressing effect on the demand for and use of natural gasoline. An industry, which had its birth in the ability of its products to create value and usefulness in the low-grade naphthas of early-day refiners, is surely not at the end of its road.

The products of the natural-gasoline industry have not, in my opinion, "come to the end of their road." A nation which has a technical ability and know-how to produce such things as an A-bomb will find uses for the valuable products of this industry. One answer is an increase in the vapor pressure of both summer and winter gasoline. The soundness of this answer is indicated in the conclusions of the N.G.A.A. Nowata road tests.

Research and development are becoming better used tools to find the answers more readily. My own company is at present completing a $350,000 research laboratory in which it hopes to find, as a part of this laboratory's work, better manufacturing methods and improved or new uses for liquid products. This is our contribution to the natural-gasoline industry's answer to the question.

We have always found the answers to our problems and this is no time to stop looking.

PROCESSING METHODS

in a gasoline plant to obtain

85 PER CENT PROPANE RECOVERY

by C. P. Stanley*

THE gasoline-plant design discussed here is indicated by the accompanying flow sheet. Objective was to recover 85 per cent of the propane and 99 per cent of the butanes and heavier hydrocarbons in the field gas from at least four different pools. The plant had a residue-gas sale for all the dehydrated gas available at 700 psig.

Air coolers used.—One major difficulty was the lack of water. The water was very hard and not available close by or in the quantity required to use steam for heating and water for cooling.

Due to the bad water situation, all cooling where possible is done with air finned coolers. This includes cooling engine-jacket water, partial cooling still overhead vapors, condensing debutanizer overhead vapors, partial lean-oil cooling, and oil reclaimer condenser. Where cooling is required below the levels available by using air-fin coolers, induced-draft cooling towers and coil sections are used.

Oil heating system.—The plant has no steam facilities; all heating is done by direct-fired oil heaters. To supply the additional heat required above that available from the hot lean oil, an oil heating system was installed. This consists of a surge tank, circulating pumps and furnaces. The heating oil is maintained at 450° to 500° F. and circulated to the points where heating is required. Since no steam is available for still stripping, ethane vapor from the deethanizer is used after being heated to 450° F.

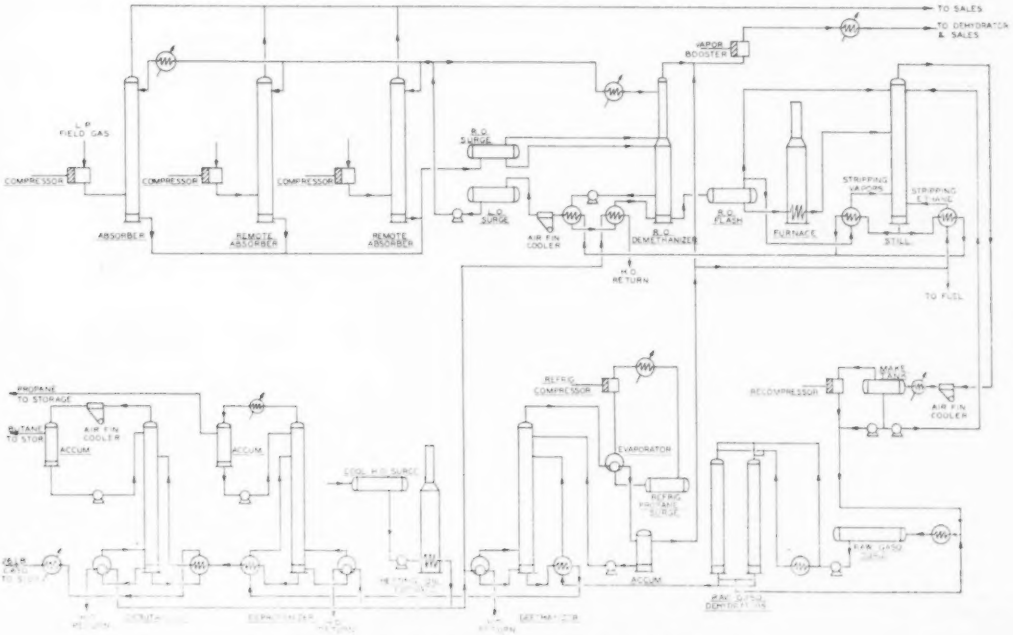
Absorption is accomplished by the conventional lean-oil absorption with intercooling. The absorption system is designed for 760 psig. operating pressure. Two remote compressor stations and absorbers were installed to serve two different outlying pools. One compressor station and absorber was installed in the gasoline plant proper which also serves two pools.

The distillation system consists of a rich-oil demethanizer, still, and recompression system.

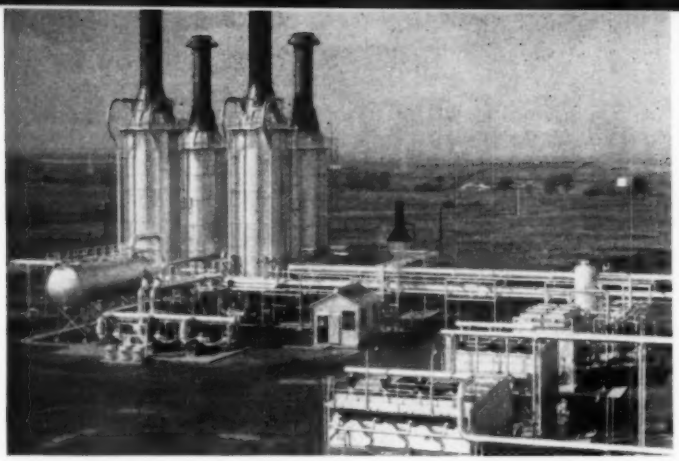
Demethanized rich oil.—Rich oil is fed to the rich-oil demethanizer which operates at 250 psig. All the methane and a substantial portion of the ethane is removed from the rich oil. The propane loss at this stage is approximately 1 to 2 per cent of the total propane in the field gas. The vapors from the rich-oil demethanizer are used for fuel, and the excess vapors are compressed to 760 psig. for sales. The demethanized rich oil is flashed to 150 psig., and the vapors injected into the still. The liquid passes through a furnace where it is heated to 525° F. and then fed to the still.

The still is designed to operate at 75 to 80 psig. Stripping is accomplished by putting hot ethane into the bottom of the still and by heating a portion of the flashed vapors from

*Dresser Engineering Co., Tulsa.



Flow scheme of a modern natural-gas processing plant.



Heating and cooling equipment in a field processing operation, a section of an installation by Dresser Engineering Co., Tulsa. The heaters shown here are the largest of their type installed in a natural-gasoline plant. Serving as engine-jacket water coolers and product condensers the coolers, lower right, are of mechanical-draft aerial type.

the rich oil and injecting these vapors into the still about five or six trays from the bottom. The still overhead vapors are partially condensed using both air-fin coolers and water-coil sections.

Vapors from the still accumulator are compressed to about 150 psig. and the condensate from the accumulator is added to the recompressed vapors before cooling, where total condensation of the raw gasoline is accomplished.

The raw gasoline is dehydrated before being fed to the deethanizer. The overhead vapors from the deethanizer are partially condensed to furnish reflux and the necessary ethane vapor recycled to the still for stripping. The excess ethane vapor is used for fuel. The deethanizer overhead product is about 99 per cent ethane. Propane losses at this stage amount to about .03 per cent of the propane in the field gas. Condensation of this ethane vapor is accomplished by using a propane refrigeration system operated at 35° F. which offers no freezing or hydrate problems since the raw gasoline has been previously dehydrated. The bottoms from the deethanizer is fed to a depropanizer.

A conventional-type depropanizer and debutanizer were installed to make commercial propane, mixed butanes, and grade gasoline ranging from 12 to 26 lb. The overhead condensation for the debutanizer is accomplished by using air-fin coolers with no water cooling being used.

Economy Principal Factor in Design Of Present-Day Processing Plant

by Meinhard H. Kotzebue*

PREDOMINANT trends in natural-gasoline and cycling-plant construction, as reflected by our customers' requests, have to do with economical considerations as they concern first cost, operating cost, and maintenance cost. The long life expectancy necessary today to justify any first-cost expenditures has changed all wartime concepts of operating and maintenance costs. For the same basic "long life" reason, today's plants must consider wide variations in feed composition and throughput, and still wider variations in product selection due to changes in market demand for L.P.G. or its components, butane and propane.

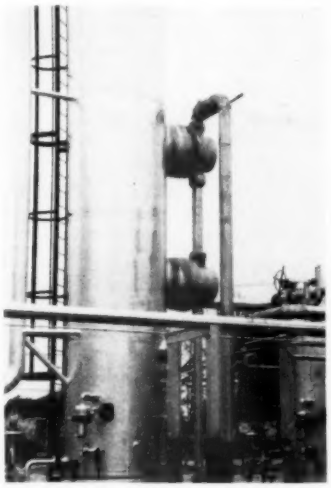
Use of refrigeration.—We have installed refrigeration, or made provision for its future installation, in all recent plants of 25 million cubic feet per day or larger capacity. All installed refrigeration has, however, been within the economic limits of ½ to 1 ton per installed horsepower. The two most common applications are: condensing ethane reflux, and absorption problems in conjunction with oil absorbers.

As applied to absorption in an oil absorber the most efficient operation results from the installation of internal elements in the absorber to offset the heat of absorption (see photo). By correctly locating these elements it is possible to have the outgoing oil no colder than the incoming gas and the residue gas no colder than the incoming absorption oil. Such an absorber need not be insulated and does not necessitate heat exchangers to recover part of the refrigeration effect that would otherwise be lost.

The evaporating pressure expressed in pounds absolute can be maintained at one-half the condensing pressure of the refrigerant if correct refrigerants are chosen and they are maintained uncontaminated. It might be added, however, that most refrigerants are subject to contamination, which factor justifies the use of special equipment and care in application.

Fuel economy.—The high efficiency and economy expected in the unit outlined above must be reflected in all equipment chosen for the plant. Fuel economy, low maintenance, and reliable performance are being given special attention when choosing fired heaters, boilers, compressors, gas-engine drives for pumps and electric generators, and any other units requiring gas for fuel. The gas consumed by the plant must vary downward with any decrease in load on the plant. This is particularly true where high extraction may or may not be desired due to fluctuations in market demand releasing varying amounts of residue gas to pipe-line sales.

The new plant will be expected to take care of the unpredictable as well as the predicted operation with the minimum of initial and ultimate expense.



Equipped with internal refrigeration elements this absorber is designed to operate at 800 psi. The unit, designed and constructed by Gasoline Plant Construction Corp., is operated by Midland Gasoline Co., Conroe, Tex.

*President, Gasoline Plant Construction Corp., Houston.

Rich-Oil Rectification Employed to Achieve Flexibility and Efficiency

by Edward C. Ragatz*

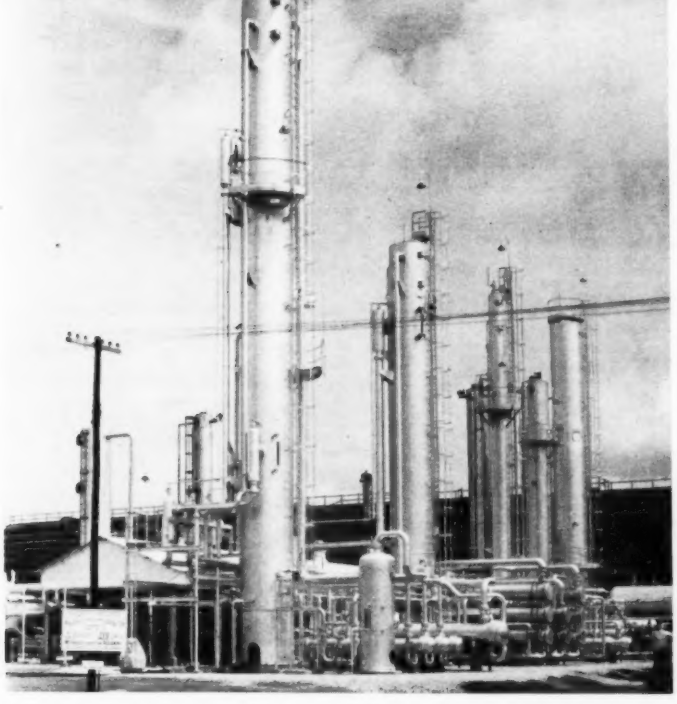
IT has become increasingly apparent that elimination of undesirable light fractions by rectification of the absorber rich oil ahead of the main stripping still (particularly in higher-pressure absorption operations) should afford a distinct advantage. This is in both initial plant investment charges and continued operating expense over the older conventional "flash and reabsorption" cycles. On the other hand, experience of many operators with earlier "rich-oil deethanization" cycles has left a serious question in their minds as to the actual effectiveness of such operations due to:

1. Certain of these installations are essentially demethanization cycles, and as such, do not eliminate the investment and operating expense requirement of a subsequent final-product deethanization operation.

2. Other installations can make the desired sharp cut (usually between ethane and propane), but only at a high fuel cost. This is due to inability effectively to recover heat from the hot lean oil by appropriate interchange with colder rich oil.

3. In many installations wherein a sharp cut can be effected between desired and undesired fractions, operation under conditions of wide daily swings in quality of rich gas processed gives trouble either with periodic production of off-specification propane or L.P.G., or failure to produce high day-in-and-day-out retention of propane.

*Associate, J. B. Gill Co., Long Beach, Calif.



Operations of the Warren Petroleum Corp., Gladewater, Tex., natural-gasoline plant now include 96 plus per cent propane extraction. The process, which makes possible this operation, was installed by J. B. Gill Co., Long Beach, Calif.

These weaknesses of the earlier rich-oil deethanization cycles have been fully met in some recent plant installations. One of the most interesting of these improved cycles is presented by the new process unit discussed below.

Warren Petroleum Corp.'s Gladewater, East Texas, plant.—This unit handles an extremely rich low-pressure gas containing 13.5 gal. per M.c.f. of propane and heavier. Due to the unique field production methods employed in the East Texas pool, the plant intake of this rich gas may vary twofold over a 12-hour operating period. At the same time the fuel-gas demands on the plant are much more uniform than the rich-gas intake rate, and must be made up with lean gas-well gas containing only 1 gal. per M.c.f. of propane and heavier.

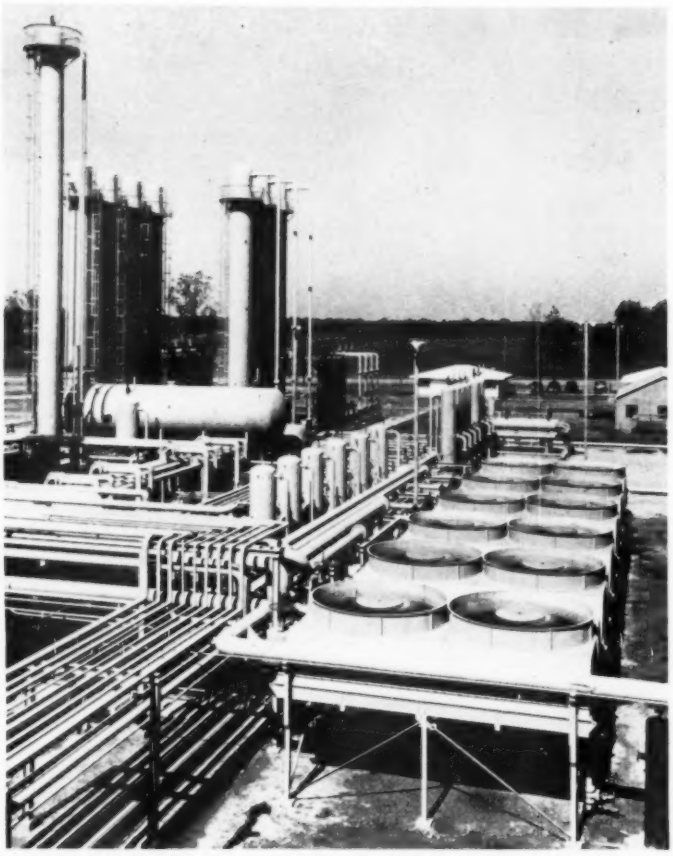
These two intake gases are treated in a single 250-psi. absorber at continuous propane absorption recoveries of 95+ per cent. The resultant rich oil is then deethanized at a rich-oil rectifier which automatically accommodates itself to changes in product quality associated with wide changes in the intake ratio of these two gases. With the aid of its automatic control, this rectifying unit operates at a day-in-and-day-out propane retention of 96+ per cent while continuously reducing the ethane content of the propane product stream to specification concentration.

Wide Changes in Gas

As an example of this plant's widely varying operation, during a period of 10-12 a.m. on a recent morning the plant processed rich gas at an average intake rate of 15,100 M.c.f. per day and lean gas at an average rate of 1,500 M.c.f. per day. During the period of 9-11 p.m. that same evening, the plant processed rich gas at an intake rate of 7,810 M.c.f. per day and lean gas at a rate of 5,700 M.c.f. per day. As a result of this wide change in intake-gas ratio, the temperature of the rectified rich-oil stream leaving the rich-oil rectifying column had to be raised from 200° F. in the morning to 255° F. that evening to maintain proper column control with a fixed column operating pressure of 200 psig.

By appropriate interlinking of volume and temperature controls, coupled with interchanging of warm lean oil with a side-circulated stream of rich oil from the rectifying column, this unit automatically effected the necessary changes in rectification control with absolutely no supplementary hand adjustment.

In addition to effecting a uniformly high propane retention with excellent ethane elimination, this unit consistently reduces the gap between the temperature of the lean oil going to the water coolers and the temperature of the rich oil from the absorber, to some 40°-45° F. without resort to any extraneous heat-recovery operation on the hot lean oil.



Direct air coolers installed by Hudson Engineering Corp., Houston, in the Carthage Corp., plant in East Texas. Such coolers came into general use in 1949. In the Carthage plant these coolers are used for condensing steam and hydrocarbon vapor and for cooling liquid products.

Highlights in Modern Gas-Compressing Plant Design Trends

by E. J. Hudson*

DURING 1949, gas-processing plants, or additions, designed and constructed by Hudson Engineering Corp. were placed in operation in New Mexico at Eunice; in Colorado at Rangely; in Louisiana at Opelousas, and Hico-Knowles; in Texas at La Gloria, Seeligson, Carthage (two plants), Benedum field, Block 31 of Crane County, and East Texas field; in Oklahoma at Madill; and in Mississippi at Brookhaven. These 13 plants are capable of treating about 1.25 billion standard cubic feet of gas daily, and employ a great variety of processing including refrigeration, absorption, dehydration using solid and liquid desiccants, compression, hydrogen sulfide and mercaptan removal, and fractionation.

A few highlights concerning process and equipment selections for the plants completed by Hudson Engineering Corp. during 1949 follow:

Centrifugal compressors. — These units were first employed in a field processing plant at La Gloria in 1944 to compress isobutane used as a refrigerating medium. These compressors were driven by 375-hp. steam turbines.

During 1949 the first major centrifugal compressor installation in a field gas-processing plant was placed in operation in South Texas. Two centrifugal compressors are installed, each driven by a 4,200-hp. steam turbine. Each compressor is designed to handle about 40 million standard cubic feet per 24 hours.

Careful comparisons of first cost and operating cost were made with reciprocating compressors and their necessary appurtenances before the centrifugals were selected. The compressor station finally installed consists of about 20,000 hp. of which about 40 per cent is in centrifugals.

When gas-combustion turbines with reasonably low fuel consumption are available to drive centrifugal compressors, and when such compressors and turbines are available for a larger range of capacity and pressure conditions than at present, they will find a large market even at greater first cost than reciprocating machines.

Indirect heat-transfer systems.—In several of the very large plants indirect transfer of heat from furnaces to fractionating column reboilers has been advantageously used, employing a transfer medium having a high boiling point and comparatively high latent heat. The transfer medium is vaporized in the furnace and condensed in the reboiler and is advantageous for accurate temperature control at the bottom of fractionating columns operating at high temperature levels. Such use is new.

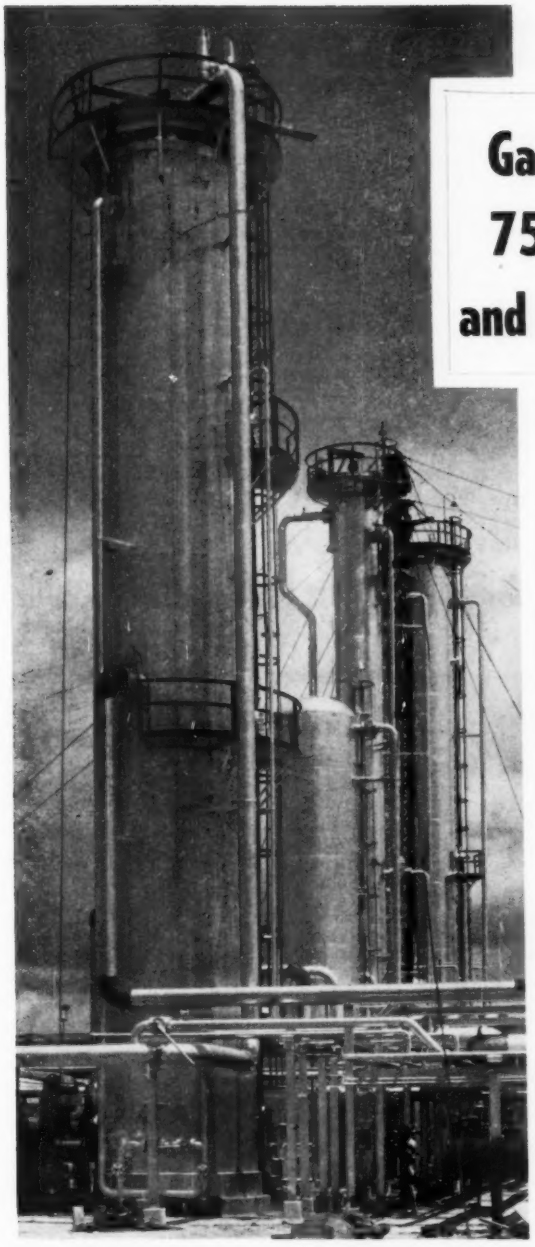
During 1949 a pipe-line gas-dehydration plant using liquid desiccant was placed in operation in Carthage gas field. This plant has reduced the water-vapor content of the gas to less than 4 lb. per million standard cubic feet when the incoming gas entered at 110° F. This is a dew-point reduction previously attained commercially only in solid-desiccant plants.

Use of the Propanizer.*—This is a rich-oil fractionator-absorber having for its purpose the replacing of methane and ethane in rich oil with propane. It has been found advantageous in processing the rich oil before distillation. Processing centering about the Propanizer minimizes or eliminates gas recycle, and has been used in many plants completed in 1949.

In equipment installations the most noteworthy points are the use of the large centrifugal compressors at Seeligson and the great general increase in the use of finned-tube surface directly to transfer to the air excess process heat from lean oil, gas, jacket water, hydrocarbon vapors, and steam. In these units air flow is moved across the outside of the finned surface with fans, usually driven by motors or steam turbines. The increase in the use of this method of cooling is attributable to the better economic comparison it now makes with alternative cooling equipment due to the reduction in the first cost of direct-air coolers in the last few years.

*President, Hudson Engineering Corp., Houston.

*Trade mark registered.



Gasoline Plant Recovers 75 per cent of propane and 98 per cent of butane

These truly outstanding recovery rates are being achieved at the Sid Richardson Company's Kermit, Texas, plant. In order to obtain such phenomenal results, this company selected the right equipment and then added two refinements, namely, recirculation of lean oil to the absorbers and propane refrigeration.

We furnished the following equipment for this highly efficient plant: the 10-ft. diam. by 69-ft., 6-in. high still shown at the left in the accompanying view; a 7-ft. diam. by 95 ft., 1-in. high debutanizer tower; two 4-ft. diam. by 10-ft. accumulator and scrubber drums; three 3,000-bbl. Hortonspheres; and three 5,000-bbl. Hortonspheroids.

This plant is typical of many where we have furnished steel plate structures to meet a variety of operating conditions. The services we offer the petroleum processing industry include x-raying and stress relieving to meet code requirements, furnishing corrosion-resistant alloy linings, and building refinery equipment for a special pressure, vacuum, or temperature condition. The next time you expand or revamp existing facilities let us furnish quotations or equipment that means efficient operation.

HORTON PRODUCTS FOR THE PETROLEUM INDUSTRY

- HORTON FLOATING ROOFS—Available in three designs . . . Double-Deck, Pontoon, or Pan . . . to provide evaporation protection for a wide range of volatile hydrocarbons.
- HORTONSPHERES—For storing butane, propane and products of similar volatility.
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Boston, 10.....1025—201 Devonshire St.
Chicago, 4.....2128 McCormick Bldg.
Cleveland, 15.....2204 Guildhall Bldg.
Detroit, 26.....1514 Lafayette Bldg.
Havana.....402 Abreu Bldg.
Houston, 2.....2119 National Standard Bldg.
Los Angeles, 17.....1523 General Petroleum Bldg.
New York, 6.....3347—165 Broadway Bldg.
Philadelphia, 3.....1615-1700 Walnut Street Bldg.
Salt Lake City, 4.....525 West 17th South St.
San Francisco, 11.....1251—22 Battery Street Bldg.
Seattle, 1.....1325 Henry Bldg.
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Here's The "Paul Bunyan" of modern line pipes

The legendary woodsman had a flair for getting BIG jobs done in a hurry. The same thing is true of Armco Welded Steel Pipe.

It comes in extra long lengths (up to 50 feet) that are light in weight and easy to handle. There are fewer sections to lay, line and join—less assembly work. Accurately beveled pipe ends make for faster, easier field welding. And the flexibility of Armco Pipe means that slack loops and cold bends are no problem. The whole job goes along faster, smoother and more economically.

You can use Armco Steel Pipe with complete confidence. It has a high safety factor against internal or external pressures. And the patented method of manufacture permits visual inspection of both sides of the wall to guard against flaws.

Armco Welded Steel Pipe is available in diameters from 6 to 36 inches with wall thicknesses from 9/64- to 1/2-inch. You can match exact job requirements. Use it for oil and gas lines, gathering systems and wherever else you need dependable piping. Write for complete data. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 4400 Curtis Street, Middletown, Ohio. 501 Mayo Building, Tulsa, Oklahoma. Subsidiary of Armco Steel Corporation.

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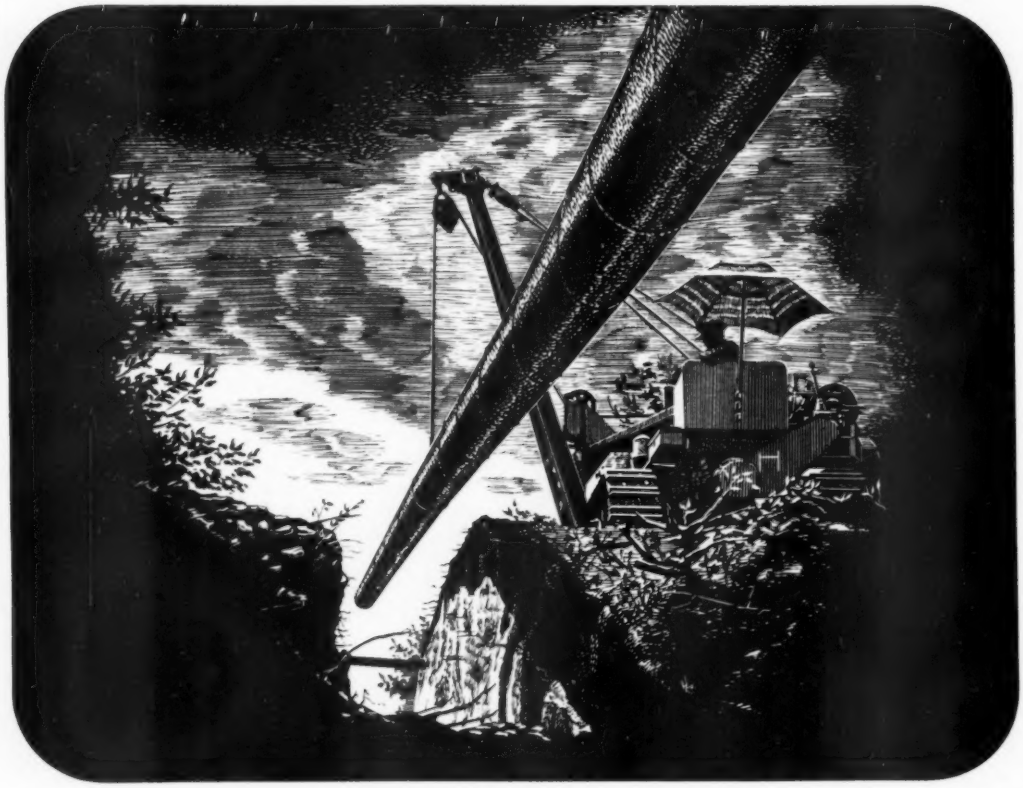
ARMCO WELDED STEEL PIPE

ARMCO



Hypersorption Provides Selective Separation of High-Purity Streams*

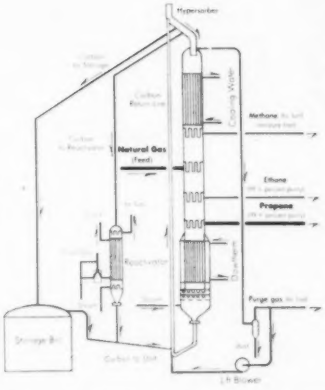
SEPARATION of moisture-free methane, ethane, and propane from natural gas can be accomplished economically by Hypersorption. This process depends on the ability of activated carbon to absorb, selectively, heavier gases from gaseous mixtures containing lighter gases.

Propane extraction is generally 98-plus per cent in a product stream containing less than 0.30 per cent ethane. When desired, 98-plus per cent of the ethane contained in the feed may be extracted simultaneously with the propane as a separate side stream of 99-plus per cent purity. The accompanying process diagram shows Hypersorption applied to this operation.

Compared economically to conventional oil-absorption methods a Hypersorption unit operating to separate 98 per cent of the propane from a feed material costs less than half of that of the oil-absorption unit when it is operated to extract only 75 per cent of the propane. This comparison takes into account investment and operating costs. Reasonable payouts may be expected in operations on natural gas containing as little as 1.5 per cent propane.

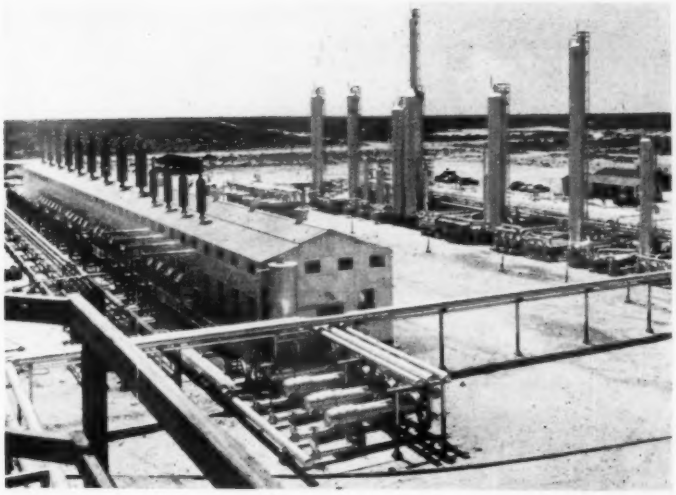
Unlike conventional fractionation,

*Foster Wheeler Corp., New York.



Diagrammatic flow arrangement of the Hypersorption process. This process operates to separate gases by adsorption.

the Hypersorption process is not upset by wide fluctuations in feed rate or feed composition. The process may be applied to removal of organic sulfur, CO_2, and H_2S. It has many other applications including various kinds of purification in field processing of natural gas.



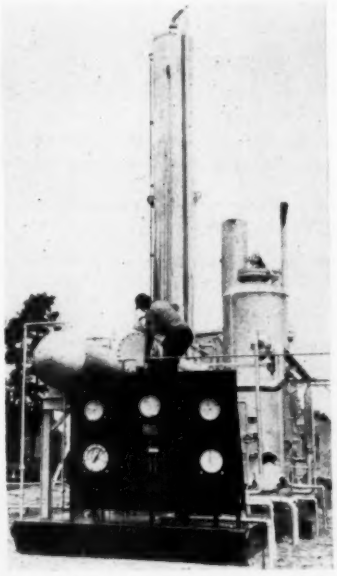
Input capacity rating on this natural-gasoline plant is 40,000,000 cu. ft. daily. Designed and constructed by C. F. Braun & Co., the plant, only recently placed in operation, is located in West Texas. A highly efficient operation, the extraction process incorporated into the layout utilizes the latest in processing methods.

Portable Catalytic Reforming Unit for Field Processing

THE first completely skid-mounted Perco catalytic refining unit has been installed for Evangeline Refining Co. at Jennings, La., by Grebe & Doremus Process Co. The unit is designed for a charge of 375 bbl. per stream day of low-sulfur, 400° F. e.p. straightrun gasoline. A C.F.R. clear octane improvement from 52 to 61-62 is realized on this reforming operation.

When stabilized and blended to 10 lb. R.v.p. with natural gasoline, a premium, ethyl-specification gasoline is made with this base stock.

The entire assembly as shown in the photograph was prefabricated and mounted on the skid in the shop at Houston. After hydraulic testing, the

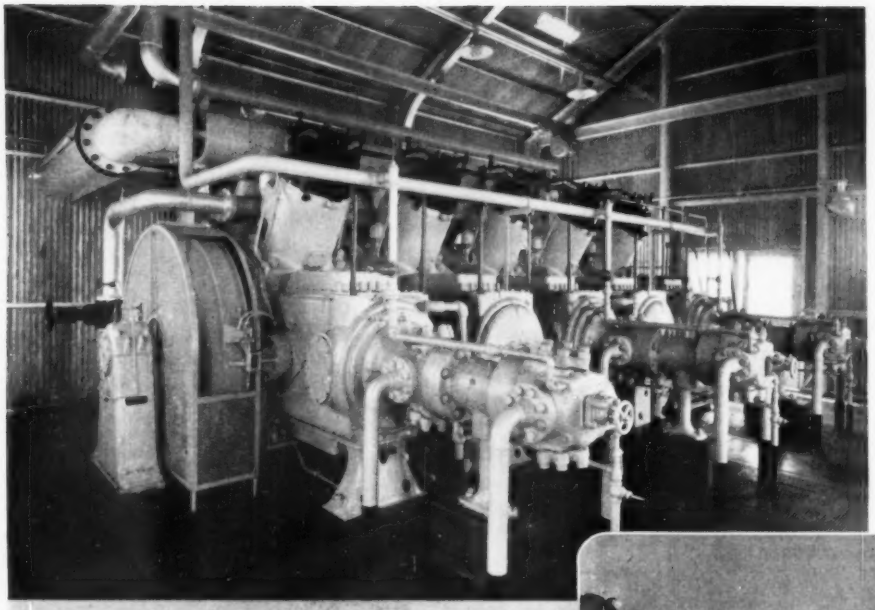


A portable catalytic reforming unit which is adaptable to distillate processing. This field processing unit was installed by Grebe & Doremus Process Co., Houston.

fractionator, due to its height, was removed from its foundation, laid on its side, and the unit was hauled by truck to the plant site at Jennings. After reerection of the fractionator, filling the reactor with catalyst, and making tie-ins to utilities, charge, and product lines, the reformer was placed in operation.

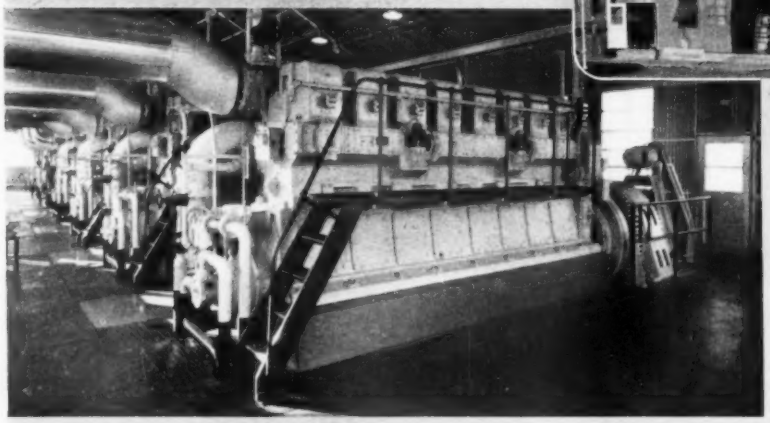
Full-boiling-range distillates may also be charged directly to these units. The same design is applicable to catalytic desulfurization, catalytic reforming, or a combination of both.

This design makes it possible for a



This 10-cylinder, 1100 hp GMV Turboflow compressor, known for extreme compactness and over-all operating economy, compresses residue gas from 1,000 to 2500 psi for return to field reservoir. Automatic control maintains constant pre-set discharge pressure.

Above: exterior of generator building showing muffler, air filter and oil cooler equipment.



This line-up of Cooper-Bessemer gas engines in generating plant consists of four 600 hp, 8-cylinder JS's driving Ideal 400 kw generators and three 280 hp, 5-cylinder Type GS engines driving Ideal 200 kw generators.

Compressors · Pumps · Engines

New York · Washington · Bradford, Pa. · Parkersburg, W. Va. · San Francisco, Cal. · Seattle, Wash.

At Sun Oil's Starr County Plant . . .

A 4-WAY JOB FOR MODERN COOPER-BESSEMERS

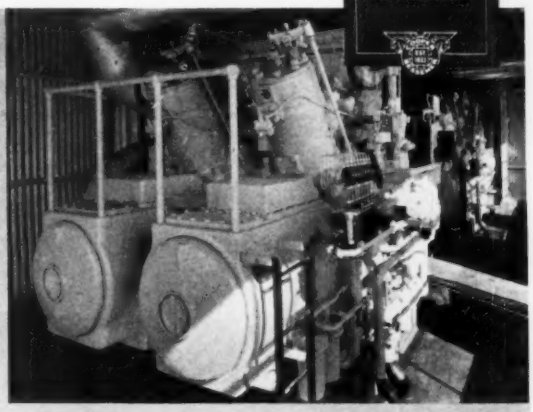
IN this new natural gasoline plant, engineered by Petroleum Engineering, Inc., there's good evidence of how well, how efficiently Cooper-Bessemer units of various types meet today's needs in power, compressing and pumping.

For in this one modern project, as shown here, you'll find Cooper-Bessemer in-line gas engines driving generators for all electric power requirements. And you'll find space-saving Cooper-Bessemer Twin-line pumps handling lean oil. These pumps in turn are direct-driven by compact Cooper-Bessemer GMX V-Type gas engines. Finally, last but not least, a 1,100 hp Cooper-Bessemer GMV Turboflow, tops today in compressor compactness and over-all economy, handles residue gas for return to a field reservoir.

To get at the reason *why* Cooper-Bessemers have been picked for all these services, you have only to weigh the important new developments introduced during recent years by one of America's *oldest* builders of engines and allied machinery.

Another Example of Efficient Power at Lower Cost

One of two Cooper-Bessemer Twin-line lean oil pumps in Sun Oil Starr County plant. High pressure side (foreground) is designed to operate on 41 API gravity lean oil, from 220 to 1100 psi while handling 248 gpm. Other side, in series, operates from 20 to 225 psi while handling 388 gpm.



Two Cooper-Bessemer GMX-4, V-Type gas engines, each direct-driving a Twin-line 6-cylinder lean oil pump through fire wall. Each GMX is rated 200 hp at 400 rpm.

by **Cooper-Bessemer**

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

Houston, Dallas, Greggton, Pampa and Odessa, Texas Tulsa Shreveport St. Louis Los Angeles

plant operator to order a complete unit tailored to meet his particular requirements much in the same way he would purchase a pump or a heat exchanger.

The entire unit is shipped prefabricated so that only tie-ins to utilities, product, and charge lines are needed to begin operation. The same operating flexibility and design characteristics are afforded as in the much larger Perco units. Furthermore, initial investment costs are on the same order of magnitude in terms of dollars per barrel of charge as for the larger units. This type design is available for charge rate of 1,000 bbl. per day or less.

Application of Refrigeration Results In Obtaining Higher Yields*

THE outstanding trend in gasoline-plant design has centered around inclusion or addition of facilities which result in higher propane yields. In existing plants, higher recoveries generally are being obtained through installation of refrigeration or other equipment which results in lowering the temperature of the absorption oil, or through increasing the lean-oil circulation rate. In new plants the provision for high propane yields is incorporated into its design.

A method for achieving this result is the use of rich-oil deethanization prior to stripping. Where propane recoveries in the range of 70 per cent are desired this scheme has been found to result in low capital and operating costs. Through use of special heat-exchanger arrangements, good heat economy likewise is obtained.

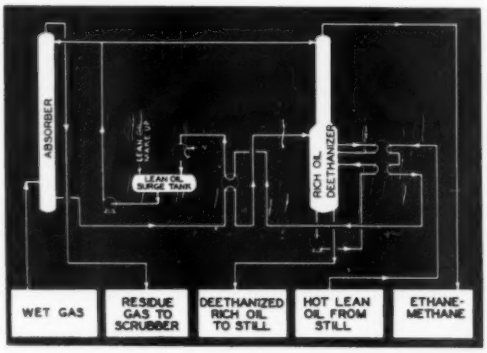
Deethanizer column.—In one plant recently completed in North Texas, designed and constructed by Fluor Corp., hot lean oil serves to provide the heat required for operation of the deethanizer via exchangers. This column, reduced from a 5-ft. lower section to a 2½-ft.-diameter upper section, contains 20 absorption and 20 stripping trays. In the processing arrangement, the column follows immediately after the 500-psi. absorber, as shown in the accompanying diagram.

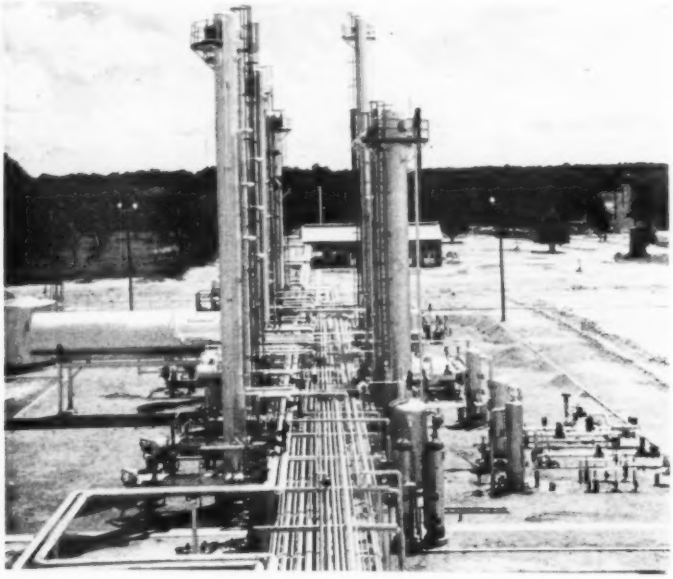
A portion of the rich oil from the bottom of the absorber first is preheated, by heat exchange with the hot stripped lean oil, and charged to the deethanizer. Remainder of the fat oil is bypassed around the preheater and enters the deethanizer on the second tray above the point at which preheated stream is introduced. Flow of lean oil to the deethanizer is flow-controller regulated and the degree of deethanization is obtained by regulating the tower-bottom temperature.

Vapor stripping. — Removal of ethane and methane components from the propane and heavier hydrocarbons, largely by the stripping vapors generated in side and bottom exchangers, greatly increases the boiling point of the partially stripped oil. This requires the addition of substantial sensible heat in the deethanizer stripping section, and is effected by heat interchange between hot lean oil and liquid in the lower part of the column.

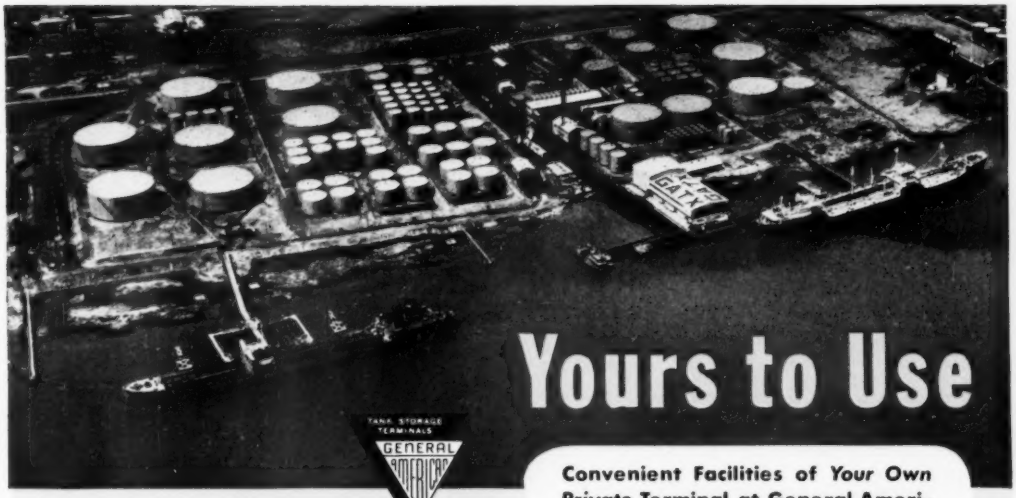
Liquid from the bottom tray of the deethanizer first receives heat from the lean oil, then the liquid from the fifth tray (from bottom) picks up additional heat from a second exchanger. Partially cooled lean oil from this second exchanger finally transfers heat to the rich oil from the absorber, as mentioned earlier, and flows to the lean-oil coolers. Hot deethanized rich oil is flashed into a 20-tray still, operated at pressures of about 100 psi., where it is stripped of its gasoline fractions.

*Prepared by Fluor Corp., Los Angeles.





Left: This field processing plant, designed and constructed by Fluor Corp., was recently completed in North Texas. Provision for high propane yield is incorporated into the plant's design. Above: Diagram of a field processing operation incorporating a rich-oil deethanizer.



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Aerial photo of Carteret, N. J. Terminal

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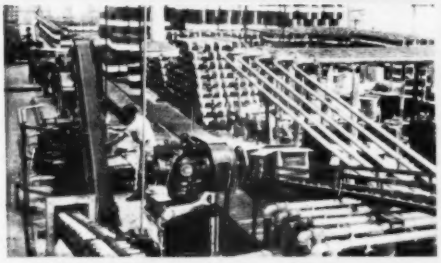
Without any capital investment, your firm may utilize all the modern facilities offered by General American Public Tank Storage Terminals. Your privacy is guaranteed . . . General American does not buy or sell any liquids. Your product is safeguarded against contamination, excessive evaporation, fire and explosion by the most modern equipment available. All General American Terminals are convenient to all types of transportation and are ideally equipped to blend and store any liquid that flows through a pipeline.



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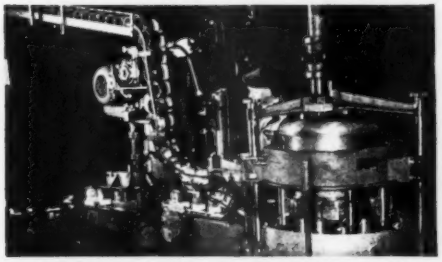

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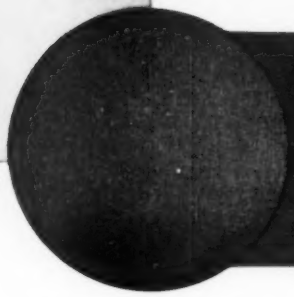
COMPARE THESE SURFACES

This enlarged photo of the finely ground surface of a Mission "File Hard" Rod shows the microscopic grooves that wear the packing and carry fine sand into the packing where it sticks and cuts the rod.



This enlarged photo shows the "Satin Finish" surface now supplied on Mission "File Hard" Rods. Notice the absence of sharp irregularities to wear the packing and catch sand.

. . . they show why the new Mission "Satin Finish" Piston Rods give even BETTER service

Mission "File Hard" Piston Rods are now being "Satin Finished" to give an ultra-smooth surface to the entire rod—threads, taper and wearing surface.

This new surface gives many benefits — the most important being longer rod and packing wear as explained in the photographs.

In addition, the satin smooth taper means better rod-to-piston fit. The result is less chance for washouts between rod and piston.

The threads are satin-finished, too. This prevents galling of threads and, by smoothing out sharp corners in the thread roots, reduces stress concentration and chances for rod breakage.

You get these finer rods at no increase in price! This is just one more example of the leadership that has made Mission products the favorite of leading majors and independents all over the world.

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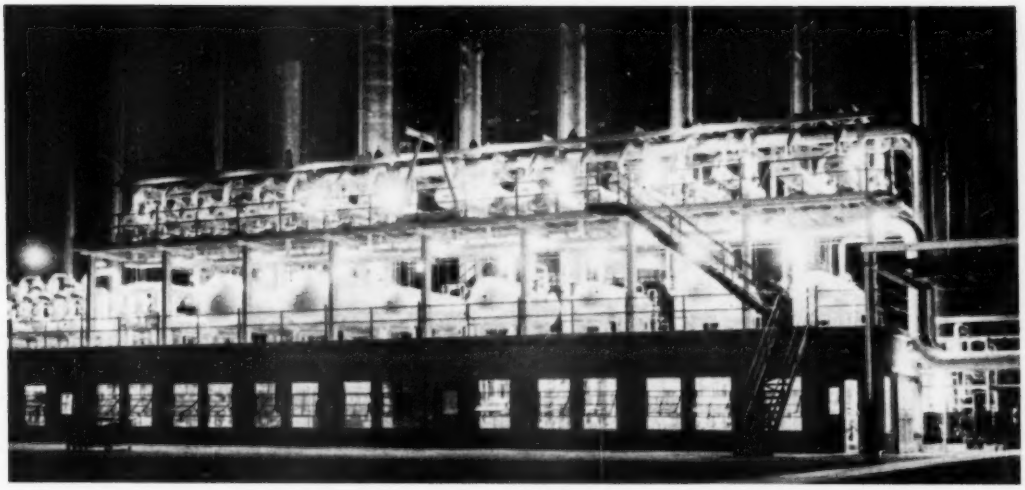
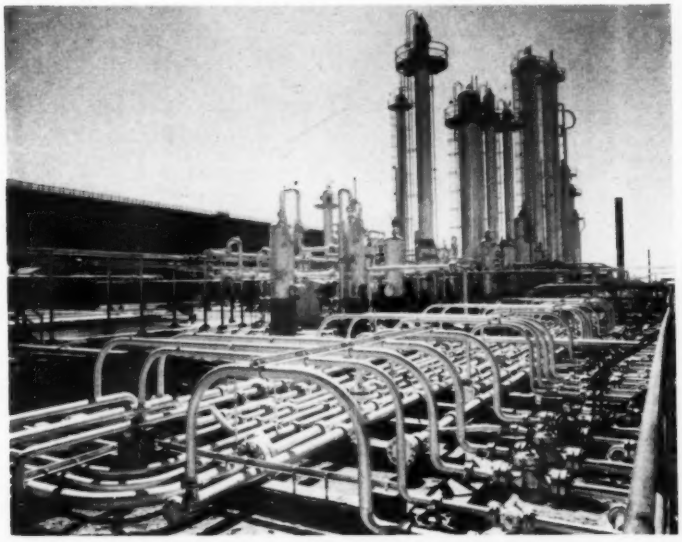


Night view of the distillation structure in a plant recently built in the Gulf Coast area by Stearns-Roger Manufacturing Co., Denver. The various pumps are located on the ground floor inside the building with reflux accumulators on the second floor immediately above their respective pumps, and condensers above the accumulators on the third deck. Construction of this type not only leads to minimum piping but to smoothest operation as liquid condensing drains directly downward through the accumulator and directly into pump suction. The arrangement provides the best possible pump suction conditions and minimizes any surging tendency since the condensed liquid is constantly and freely draining into the accumulator without slugging as is sometimes experienced in long horizontal lines. This particular plant handles gas entering at 10-in. of vacuum and discharges at final pressure of 3,515 to 5,000 psi. through five stages of compression.

FIELD PROCESSING PLANTS RECENTLY COMPLETED

This gasoline plant, only recently expanded by Ralph M. Parsons Co., Los Angeles, is one of the larger field processing installations in California. The major equipment included in the expansion program consisted of 2,400 hp. compressor capacity, a deethanizer, and cooling-water facilities plus a cooling tower.



Improved Propane Extraction From Rich-Oil Stabilization

by Norman K. Rector*

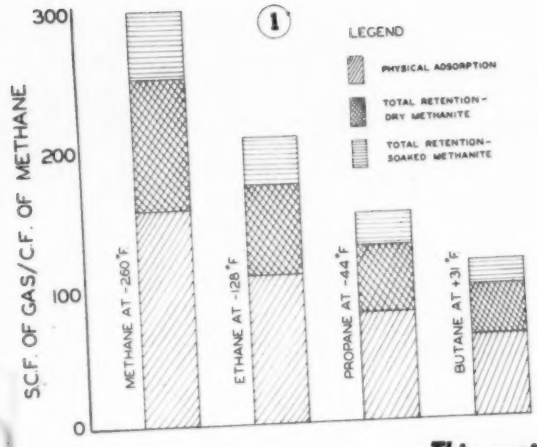
DURING the past year two plants incorporating Petroleum Engineering's version of rich-oil stabilization for high propane recovery have been completed. It should be recognized that the fundamental idea of rich-oil stabilization is not new. The writer remembers rich-oil stabilizers designed and built by others in the middle twenties. These earlier units were not too successful nor economical. The purpose was somewhat different from the purpose of the units recently installed by this company and others.

In the earlier installations it was attempted to remove excess butanes and lighter hydrocarbons from the rich oil prior to distillation so that the product distilled from the stabilized oil would be propane free and of the proper vapor pressure for marketing. These earlier units were generally abandoned in favor of product stabilizers following distillation.

The rich-oil stabilizing units now employed become practical because the material retained in the bottom

*Petroleum Engineering, Inc., Houston.

(Continued on page 256)



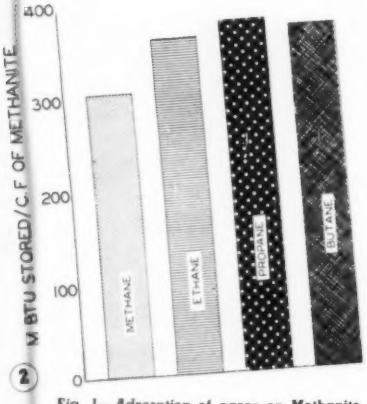


Fig. 1—Adsorption of gases on Methanite. Fig. 2—Absorbed fuel values of gases adsorbed on Methanite.

About 2 qt. of propane adsorbed on Methanite burns with a lazy flame on exposure to atmosphere.

New, Safe, Practical

Storage and Transportation

method for light hydrocarbons

This article presents the results of pilot-plant operation on methane, and discusses extension of process for handling propane, butane, etc.

by C. V. Spangler,* W. W. Bodle,† and W. T. Granquist‡

A SAFE, practical, and economical method for storing large amounts of light hydrocarbons, and for efficient handling of these fuels while in transport by rail, tanker, or barge, has reached the pilot-plant stage.

This new technological development for stock piling propane, butane, and related hydrocarbons on solid adsorbents at reduced temperatures has been brought about by the combined abilities and efforts of Floridin Co., Warren, Pa., and J. F. Pritchard & Co., Kansas City, Mo.

About a year ago, Spangler proposed the use of solid adsorbents for the storage of natural gas. He believed this method of storage could be economically put into practice as an individual plant system where storage service was needed.

A pilot plant was created at Warren. Its operation has proved a year's basic laboratory research results.

*Pittsburgh representative, and †chief processing engineer, J. F. Pritchard & Co. ‡Director of laboratories, Floridin Co.

There is a definite advantage in the storage of natural gas in the aboveground container filled with fuller's earth. That advantage, as compared to the storage of the fuel in a liquid state, is that the adsorbed gas is not free to flow in case of tank failure. Also, the release of the gas from the granular adsorbent is relatively slow, even though the gas could actually be burning at the surface of the adsorbent.

Sufficient theoretical and practical research has been conducted to enable the writers now to present a few of the results of pilot-plant operation on methane, and to discuss the extension of the process for handling propane, butane, or similar light-hydrocarbon fuels.

Table 1 presents physical constants for the gases studied, plus pertinent adsorption data. Line 3 shows the number of standard cubic feet of gas contained in 1 cu. ft. of the liquid hydrocarbons—methane through butane—at normal boiling points of the

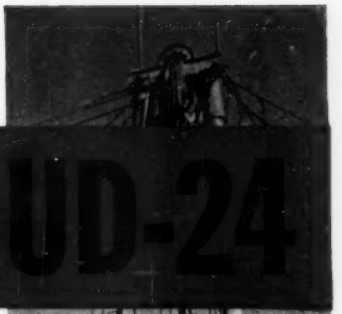
TABLE 1—PROPERTIES AND ADSORPTION CHARACTERISTICS OF LIGHT HYDROCARBONS

	Methane	Ethane	Propane	Butane
1. Boiling point, °F.*	—258	—128	—44	+31
2. Liq. sp. gr. at B.P.*	0.4240	0.5462	0.5824	0.5788
3. S.C.F. gas/cu. ft. liq.	625	430	313	236
4. Heating value†	1,012	1,762	2,500	3,261
5. M. B.t.u./cu. ft. liq.	633	758	785	770
6. S.C.F. of adsorbed—physical adsorption	§156	¶107	¶78	¶59
7. Gas per cu. ft. of Methanite‡—Total retention dry	‖251	‖173	‖126	‖95
8. Total retention soaked	§300	207	150	113
9. M. B.t.u./cu. ft. of Methanite‡	304	364	376	368

*Source, Egloff, G., "Physical Constants of Hydrocarbons, Vol. 1," Reinhold Publishing Co. (1939). †Trade mark registered. ‡Gross heat of combustion at 60° F. and 30-in. Hg., dry basis. §Experimental measurements. ¶Calculated. ‖Based on 40.1 per cent pore volume.

Wildcatter's Winner—

THE INTERNATIONAL UD-24



"The extra power of the International UD-24 lets us stay in the hole for a longer period of time. This means less time is necessary for tool pulling and baling," says E. A. Ungren of Abilene, Texas. The UD-24 is powering his cable tool rig, drilling down to 2370 feet.

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liquids. These quantities result in heating values for 1 cu. ft. of the liquefied gases that are shown in line 5—based on the indicated heating values for the gases.

Continuing inspection of this table, note that lines 6, 7, and 8, and Fig. 1, present the quantities of the light-hydrocarbon gases which are retained on the fuller's earth. In this process for which a patent is pending, the granular adsorbent is named Methanite, on which a trade mark has been registered.

The adsorptive capacities indicated are defined as follows:

Physical adsorption—the quantity adsorbed under equilibrium conditions at a pressure equal to the vapor pressure of the gas at the temperature of the adsorption. This is measured by the well-known standard method of Emmett and Brunauer.

In **total retention, dry,** the quantity retained on the adsorbent under conditions where the entire pore space of the adsorptive material is filled with the adsorbed phase, but no liquid clings to the outer surface of the adsorbent particles.

Under **total retention, soaked,** this represents the last defined quantity, plus the volume of gas equivalent to the amount of liquid required to wet the adsorbent particles.

The adsorptive capacities shown in line 8 may be converted to the heating values per cubic foot of totally saturated Methanite. Such heating values are shown in line 9 and in Fig. 2.

Note particularly that the values in line 9 are in all cases approximately 48 per cent of the values shown in line 5.

Thus, storage on Methanite requires about twice as much storage volume as storage for liquid at equal fuel values. It is believed that the extra safety afforded by storage in the adsorbed state, will in most cases, make the additional storage volume required most worth while.

The capacities shown in line 8 of Table 1, and in Fig. 2, as "Total Retention, Soaked Methanite" are based on the values obtained for methane in the pilot plant at Floridin Co. in Warren.

Experimental Work, Pilot Plant

Adsorption was effected by trickling liquid methane down through a bed of the granular adsorbent. Excess liquid which ran from the bottom of the bed was removed.

The Methanite adsorbent, thoroughly wet by the liquid methane, does not contain any liquid which can flow if the adsorbent should be spilled out on the ground.

The data on pilot-plant operations was obtained from adsorbent beds containing 5 lb. and 63 lb. of adsorbent. This gave capacities of 50 and 630 standard cubic feet respectively.

The smaller bed was surrounded by a jacket which was filled with liquid methane during adsorption. Warm gas was passed through this jacket to heat the bed during the desorption phase.

The larger bed was contained in a thin copper vessel. It was surrounded by block Foamglas insulation and a heavy wall steel outer tank. The desorption phase of this larger bed was accomplished by passing warm gas directly through the bed.

The variables studied in this pilot plant included the effect of temperature and pressure on adsorption, adsorbent characteristics, and comparative ignition characteristics of both liquid methane and "soaked" Methanite.

It is interesting to note that when liquid methane is ignited, the combustion is violent and extremely rapid. It spreads over a wide area and is essentially completed in a few seconds.

An entirely different picture is obtained with the soaked Methanite. When the same quantity of gas is used, and is ignited, it burns quietly. The combustion of gas from the soaked Methanite resembles the flame on the wick of a lamp, rather than any flash firing. Tests indicated a total burning time of about 2 hours.

It is also interesting to note that if the Methanite is not mechanically agitated while burning, the fire will actually go out before all of the gas is released from the granular adsorbent. (Note the accompanying illustrations concerning the variance in ignition characteristics.)

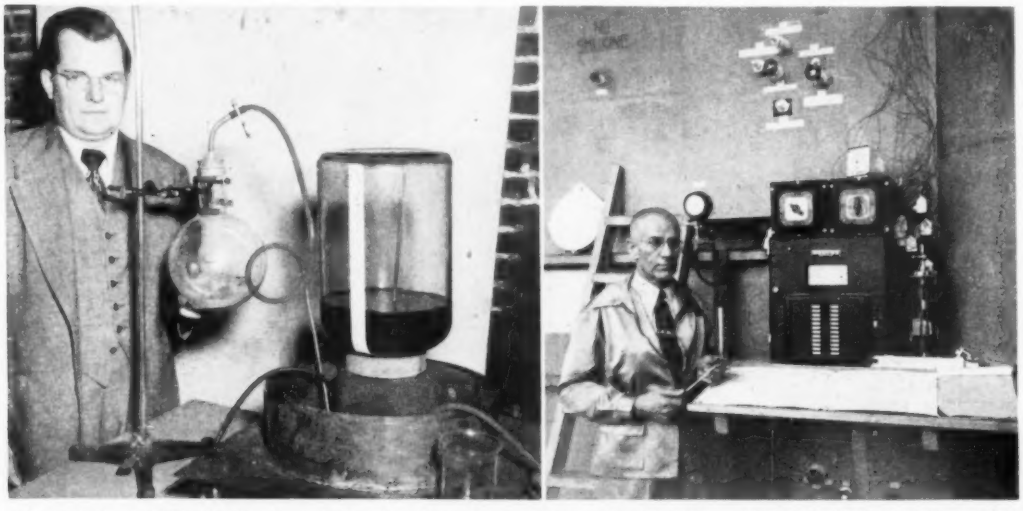
This method of stock piling methane appears to be a timely contribution to the gas industry where considerable effort is now being expended to meet peak-load requirements and to obtain more favorable demand commodity rates.

In addition, this aboveground method of storage has a definite bearing on the future of handling liquid propane.

Not too many years ago, there was no such thing as a propane or butane tank farm. Codes were written around the design and installation of one or two aboveground cylindrical vessels.

The natural-gas "shortage" in dis-

(Continued on page 193)



Left: J. W. Moore, of Floridin Co., demonstrating the volume of propane gas coming off of 20 cc. of Methanite. Right: E. W. Burt, of J. E. Pritchard & Co., at the control panel of the pilot plant.

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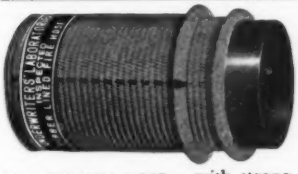

BWH TREATED HOSE — with strong, protective brown jacket, treated to resist mildew, freezing, strong sunlight and excessive moisture. Treatment doesn't cause hose to get hard, or heavy in wet or cold weather. Doesn't get greasy or sticky in warm weather. Double jacket shown; also comes with single jacket.

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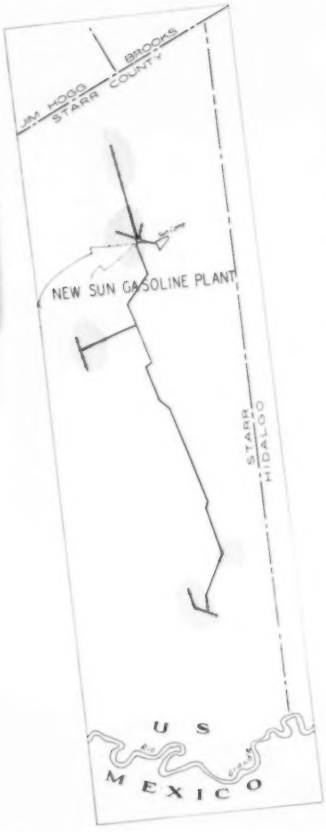
New Sun Plant Serves Five Southwest Texas Oil Fields

by Roy F. Carlson
Dallas District Editor

Over-all view of the new Sun plant showing (left to right) the four-cell cooling tower, stripping and refractionation section, gas-fired oil heaters (in background), absorption and gas-intercooling equipment, and compressor and power generating buildings.



THE recently completed gathering system and gas-processing plant of Sun Oil Co. in Starr County, Southwest Texas, offer concrete evidence of the current industry trend toward complete utilization of all natural gas. Site of the plant is in Sun field.

Casing-head gas from as far distant as 26 miles is processed in the plant. Five separate oil fields are presently being served by the plant. None of the fields had a sufficient gas supply to justify the erection of a modern, efficient plant, but by combining their gas production the project was economically feasible.

Another forward step in gas conservation is Sun's use of an underground reservoir for storing the residue gas until a pipe-line outlet is available. This outlet, Transcontinental Gas Pipe Line Co.'s 30-in. line to New York, will not be in operation until about a year from now. Meanwhile, gasoline-extraction operations will go ahead with the dry gas being stored in a 4,100-ft. gas reservoir in Sun field.

The plant, which has a daily throughput capacity of 35,000 M.c.f., will take some 22,000 M.c.f. of casing-head gas from Sun, North Sun, North Rincon, Yturria, and Garcia fields. In addition some 13,000 M.c.f. of high-pressure gas will be taken from gas-distillate wells in the area.

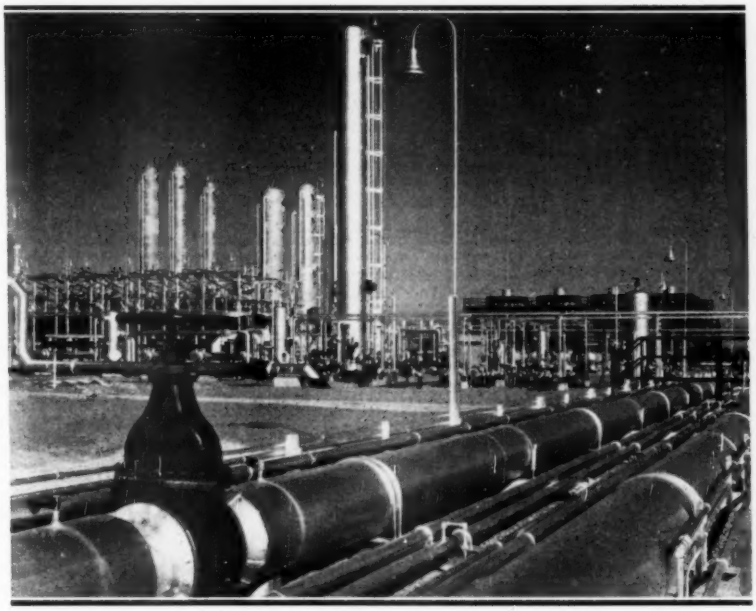
Field most distant from the plant is Garcia, some 26 miles south of the plant. To transport this gas, and that from nearby Yturria field, some 19 miles of 12-in. main line was laid northward to North Rincon field. There the main was enlarged to 24 in., the diameter of the remaining 7 miles of line into the plant. A booster station constructed at Yturria increases the line pressure to about 35 psi. for transmission through the 12-in. section of line.

At the plant site gas from these fields to the south is passed through a scrubber and then goes into a 30-in. header from which all process compressors take suction. A 22-in. line serves Sun and North Sun fields and 8 and 16-in. lines bring in additional low-pressure gas. These join into a 24-in. main line leading to a second scrubber, which feeds gas into the opposite end of the 30-in. header.

In Table 1 are shown the approximate compositions of casing-head and gas-condensate well gas used for design purposes. The plant was designed to recover at least 95 per cent of potential butanes present in the gas, 80 per cent of the propanes, and substantially all of the pentanes and heavier hydrocarbons. Thus when operating at design conditions and producing a butane-free natural gasoline, the plant's daily output will be 38,000 gal. of gasoline, 29,000 gal. of propane, and 33,000 gal. of butane.

Absorption at 1,045 Psi.

The casing-head gas is compressed in four stages from an inlet vacuum of about 10 in. Hg. to a discharge pressure of 1,050 psi. After passing through a final cooler and accumulator it enters the main absorber op-



★ Starr County Plant built for Sun Oil Company is one of over 200 plants built in a 20-year period of service to the natural gasoline and refining industries by Petroleum Engineering, Inc.

Plant statistics — Capacity: 35 million cu. ft. of natural gas per day. Daily Production at capacity: 40 thousand gallons of gasoline, 60 thousand gallons of liquefied petroleum gas. Extraction Efficiency: Propane, 80%; Butanes and heavier, 99+%.

The designers of Sun's Starr County Plant are available for consultation on your processing problems.

Petroleum Engineering, Inc.

Houston

Photographed for Petroleum Engineering, Inc., by
Robert Yarnall Richie — Gulf Coast Films, Inc.

TABLE 1—COMPOSITION OF INLET GAS

Component—	Gas, mol per cent— Casing-head	Condensate well
Methane	80.02	88.91
Ethane	8.62	5.15
Propane	4.86	1.68
Isobutane	1.78	0.57
Normal butane	2.14	0.80
Isopentane	1.05	0.27
Normal pentane	0.67	0.28
Hexanes	0.47	0.53
Heptanes and heavier	0.36	1.81
Carbon dioxide	0.01	.....
Total	100.00	100.00

erated at 1,045 psi. Stripped gas from the absorber is presently being further compressed to 2,250 psi. for temporary storage in Sun field.

Rich oil from the absorber, after being flashed to 300 psi., is joined by the small amount of condensate knocked out in the fourth-stage discharge accumulator. After being preheated by heat interchange with hot lean oil, the rich oil enters about midway up a reabsorber-demethanizer column on which a pressure of approximately 185 psi. is held. Overhead gases from the tower (largely methane) are commingled with fresh lean oil, the stream cooled slightly, and then run to a flash tank. There the gas, which averages about 98 per cent methane and ethane, is removed for use as engine fuel while the methane-saturated oil is charged to the top of the tower. In this manner selective absorption, as between methane and the heavier hydrocarbon components, is obtained.

The enriched oil, removed from the base of the demethanizer at about 290° F., is preheated to 400° F. by heat exchange with the hot lean oil. It is then flashed and charged to two gas-fired oil heaters where the temperature is raised to around 508° F. After again being flashed, the heated oil is charged first to a high-pressure still, operated at 195 psi., and then to a low-pressure still operated at 60 psi.

Condensed overhead vapors from the two stills, in excess of reflux requirements, are further cooled and run to the raw-gasoline surge tank. The product is then fractionated into finished propane, butane, and natural gasoline in conventional deethanizing, depropanizing, and debutanizing columns.

One unusual provision is incorporated in the plant's propane-recovery facilities. When propane is in demand the overhead vapors from the depropanizer are condensed and excess over reflux requirements is passed through dryers and run to storage. For periods when propane is not in demand, provisions were included to make possible minimum recovery of propane from the wet gas—it would remain in the residue gas and be injected into the reservoir.

In this latter operation, propane will be removed from the reflux accumulator and returned to the lean-oil pump for injection into the second-stage suction at 220 psi. The lean-oil stream thereby will be partially saturated with propane before it contacts with the wet gas so that its ability to absorb additional propane fractions will be greatly reduced.

Processing Equipment

Six 1,200-hp. two-cycle gas-engine-driven compressors are used to boost the low-pressure gas to the 1,045 psi. absorption pressure. The single compressor used to boost the pressure of the residue gas from 1,000 to 2,250 psi. is a 1,100-hp. gas engine with three compression cylinders.

Lean-oil circulation is maintained by two two-stage reciprocating pumps driven by 200-hp. gas engines. In the low stage, which supplies lean oil to the demethanizer, each pump's output is about 388 g.p.m. at 225 psi. In the high stage about 248 g.p.m. is raised from 225 to 1,050 psi. and discharged to the main absorber.

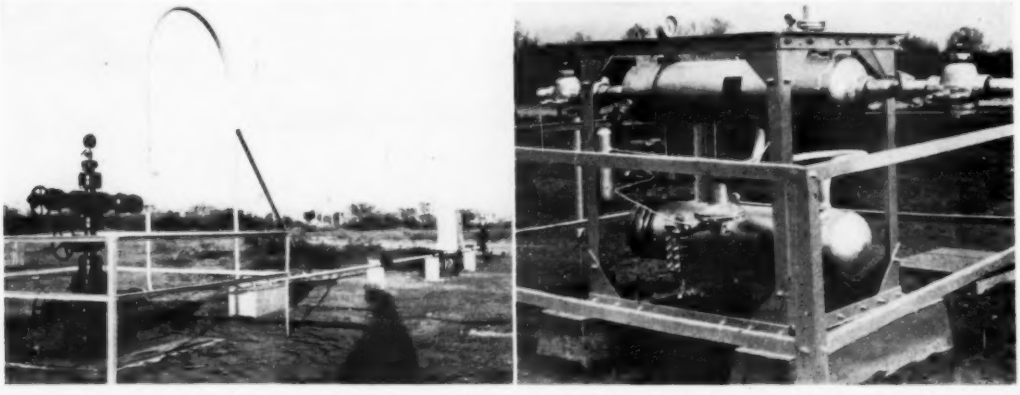
Steam-powered reciprocating pumps are used to supply reflux to both stills and to the three fractionating towers, and to charge the deethanizer. Steam-turbine-driven centrifugal pumps supply reflux to the demethanizer and charge rich oil to the gas-fired furnaces. Water circulation to the four-cell cooling tower and in the jacket-water cooling system is maintained by six vertical centrifugal pumps driven by 100-hp. electric motors.

Two wells in the plant yard, drilled to an 800-ft. water sand, furnish an adequate water supply. The raw water is first run to storage, after which it is treated with sulfur dioxide in a wooden tower about 14 ft. high. The SO_2 vapors are obtained from burning crude sulfur in a small generator. Makeup water for the cooling tower is removed from a collecting basin beneath the tower while that to be used as boiler-water makeup is further treated with sodium zeolite, sodium sulfite, and tannin.

Steam for operation of the turbine-driven centrifugals, for stripping, and for heating the external-fired reboilers is generated by three oil-country fire-tube boilers. These are rated at 150 hp. with a 250-psi. working pressure.

Electric power for the plant and camp, and for Sun Pipe Line Co. requirements, is supplied by a 2,200-kw. generating plant. This consists of four 600-hp. gas engines driving 400 kw., 480-volt generators and three 280-hp. units driving 200-kw. generators. Power to be transmitted to the employe camp and the pipe-line station is converted to 2,300 volts.

For storing the plant's output, two 10,000-bbl. gasoline spheroids, two 5,000-bbl. butane spheres, and 10 horizontal 27,100-gal. propane blimps were erected at the plant site. A two-spot truck loading rack handles propane, butane, and L.P.G. at the plant site. Outlet for natural-gasoline production is by Sun Pipe Line Co. The gasoline is transported by crude-oil pipe line to the Sun Pipe Line Ingleside terminal and on to Sun's Marcus Hook Refinery by tanker.



Left: Injection well near the plant site for temporarily returning the plant's residue to a 4,100-ft. gas sand. When a pipe-line outlet is provided, gas will then be withdrawn. Right: This is a Sun gas well and Hydraceptor which is feeding high-pressure gas to the new plant.

Platforming Of Natural Gasoline

by E. K. Sutherland* and D. D. Hanson*

In order for the natural-gasoline manufacturer to compete in the motor-fuel market, he must have a process which will produce a competitive gasoline in order to protect him from the loss of income due to the sharp price drops which have occurred over the past years. The average price differential between natural gasoline and finished motor fuel has steadily increased and processing of natural gasoline for octane improvements has become imperative. The accompanying article on "Platforming of Natural Gasoline," especially written for this issue of The Oil and Gas Journal, discusses a new process applicable for upgrading of natural gasoline for high-octane markets.

PRODUCTION facilities for the manufacture of natural gasoline are now at a new record level. Construction of natural-gasoline and cycling plants has been at an unprecedented pace during the past 2 or more years.

This tremendous expansion in natural-gasoline-manufacture facilities is the result of several factors including the increased production of crude oil and its attendant natural gas, the increased conservation measures for saving and utilizing natural-gas production, and last but not least, the growth of the natural-gas industry. Expansion of the large-size pipe-line

*Universal Oil Products Co., Chicago.

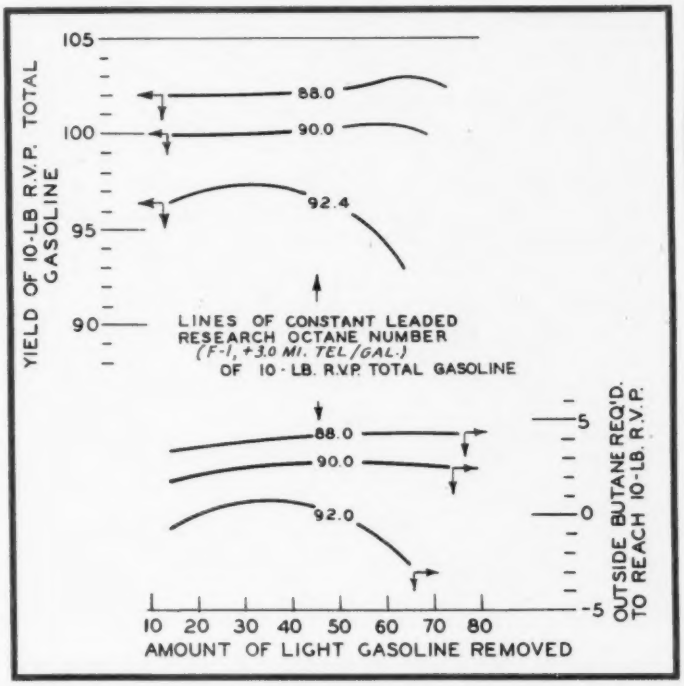


Fig. 2—Effect of bypassing the light gasoline on the yield-octane number relationship. Basis: Liquid volume per cent of total C_5-400° F. natural gasoline.

Fig. 1—Simplified flow diagram of Platforming unit.

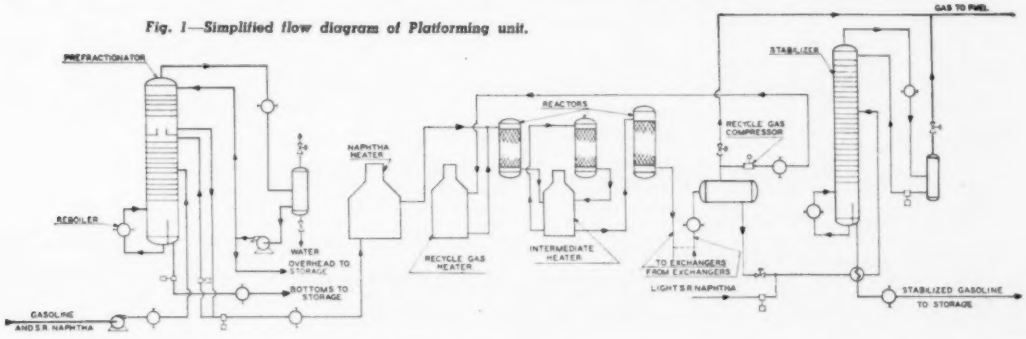


TABLE 1—TYPICAL RESULTS FROM PLATFORMING NATURAL GASOLINE

Platformer feed source	Lake Creek (Texas)			Haynesville field (La.)			La Gloria (Texas)				Carthage (Texas)		
	Feed	Platformate		Feed	Platformate		Feed	Platformate			Feed	Platformate	
Yield, L.V. % of Platformer feed	100.0	95.7	92.5	100.0	91.2	86.7	100.0	94.8	89.3	85.9	100.0	94.1	91.5
Inspections:													
°A.P.I. at 60° F.	57.3	55.5	54.1	58.7	60.4	60.5	51.8	51.6	53.1	55.2	59.5	62.2	63.2
R.v.p.	2.8	4.7	8.6	(1.5)	8.5	10.5		4.0	8.5	13.3		9.8	13.2
K	11.83			12.13			11.80				12.11		
MW	104			120			123				115		
Sulfur, wt. %				0.013			0.02						
A.S.T.M. D-86, distillation:													
I.b.p., °F.	147	132	114	196	100	90	277	115	100	90	198	98	90
5 per cent	174	158	137	214	127	112	284	198	130	110	210	125	120
10 per cent	182	170	152	220	143	126	286	242	150	135	215	140	130
30 per cent	206	198	186	248	198	180	290	282	223	190	232	182	170
50 per cent	234	226	218	278	238	226	294	293	275	248	259	218	205
70 per cent	273	264	256	311	276	270	300	304	300	290	294	258	245
90 per cent	336	324	316	352	335	337	313	325	326	325	348	325	318
95 per cent	368	356	343	368	362	368	320	337	340	340	369	352	342
End point	397	400	427	388	400	416	342	365	392	402	388	410	420
% bottoms	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
% loss	0.5	0.5	1.0	0.0	1.5	2.0	0.0	0.5	1.0	1.5	0.0	1.0	1.5
Octane numbers:													
Research method (F-1):													
Clear	59.4	78.1	88.0	39.9	76.7	84.9	43.5	74.0	89.4	96.2	36.6	78.3	86.7
+3.0 ml. TEL/gal.	78.3	91.0	96.1	64.4	90.3	95.0	65.5	88.8	97.6	iso-C_5 + 0.1	62.0	91.9	96.0
Motor method (F-2):													
Clear	53.7	72.3	80.2	35.1	73.0	78.8		68.1	80.9	86.3	33.9	73.7	80.3
+3.0 ml. TEL/gal.	76.6	(85.0)	(88.0)	64.2	(87.0)	(90.7)		82.0	88.1	93.4	63.5	86.7	90.0

network carrying natural gas to virtually all parts of the United States has been one of the most rapid construction jobs that the petroleum industry has ever witnessed.

It is the liquid production from the natural gasoline and cycling plants which will be discussed in this article. In order to appreciate the overall motor-fuel situation as it presently exists and to evaluate trends over the next few years, we have made a few rough calculations. These calculations must of necessity be general, as rapid changes are taking place which make it difficult for statistics to keep pace.

The total gasoline production in the United States, according to current surveys covering the past year, may be divided approximately as 23 per cent catalytic cracked, 30 per cent thermal cracked, 30 per cent straight-run, and the remaining 17 per cent natural gasoline.

The over-all trend has been for total production to decrease slightly (with the exception of natural gasoline), but for the percentage of high-octane catalytic cracked gasoline (96-99 leaded research octane) to increase. This increase has taken place in general at the expense of thermal cracking by the rapid installation of new catalytic units, and also because of the tendency to crack deeper due to high inventories of heating-oil stocks. This trend has increased the amount of high-octane gasoline on the market. In addition to increased gasoline produced by catalytic cracking, there have been increased quantities of natural gasoline.

Motor-car manufacturers, noting the economic soundness of the catalytic cracking operation over the 5 years since this type of gasoline reached the market, have felt justified in increasing the octane requirements of stock motors, thus generating an in-

(Continued on page 194)

TABLE 2

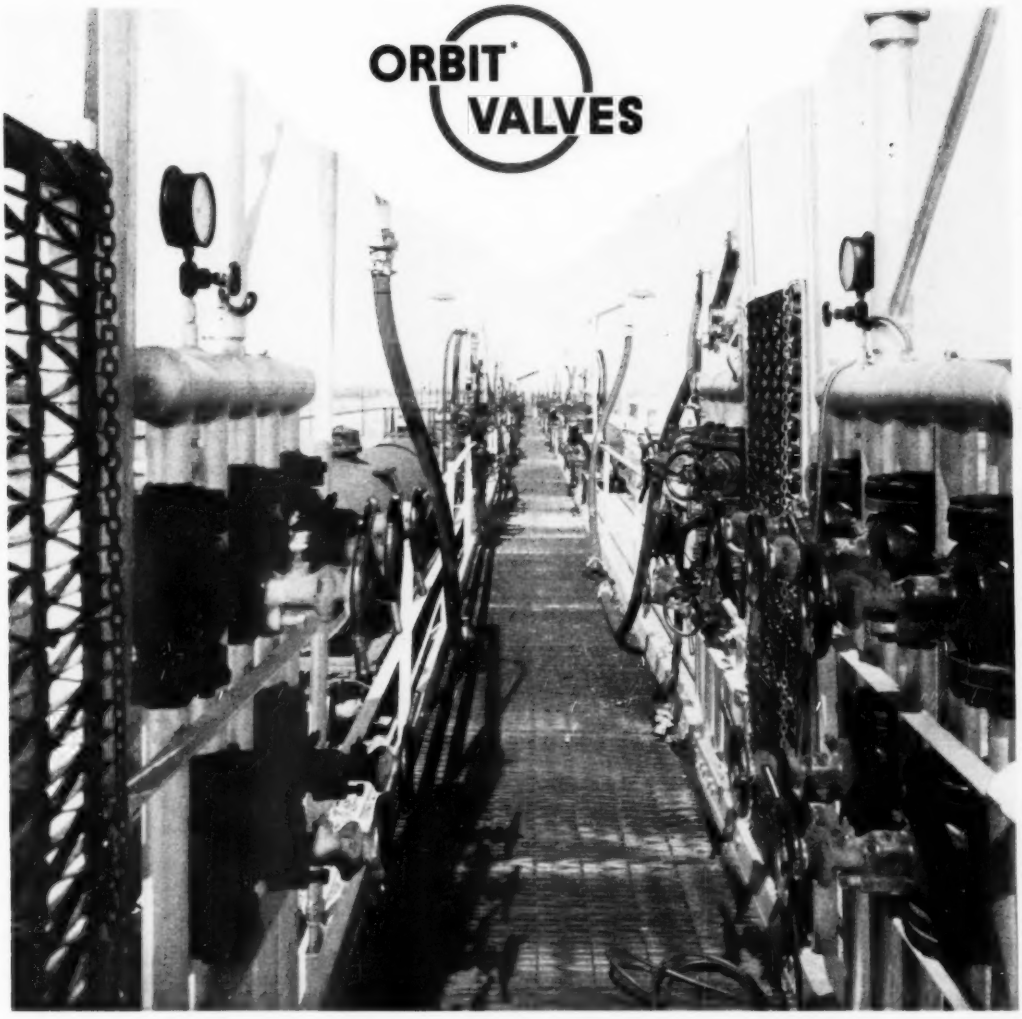
Inspections on Debutanized Natural Gasoline from Carthage (Texas)

L.V. per cent of total C_5-400°F. natural gasoline	100.0
Inspections:	
°A.P.I. at 60° F.	67.5
R.v.p.	5.2
K	12.30
MW	100.0
A.S.T.M. D-86 distillation:	
I.b.p., °F.	95
10 per cent	136
30 per cent	170
50 per cent	208
70 per cent	260
90 per cent	350
95 per cent	385
End point	410
Octane numbers:	
Research method (F-1):	
Clear	46.5
+3.0 ml. TEL/gal.	74.4
Motor method (F-2):	
Clear	46.8
+3.0 ml. TEL/gal.	73.8
Composition:	
i-C_5H_{12}, L.V. per cent	10.4
n-C_5H_{12}	6.9
C_6+	82.7
	100.0

TABLE 3—EFFECT OF BYPASSING THE LIGHT GASOLINE ON YIELD-OCTANE RELATIONSHIP

Points of Maximum Yield Octane Number Relationship on Fig. 2

Processing scheme:			
Boiling range of reactor feed, °F.	250-410	230-410	180-410
Reactor feed, L.V. per cent of total C_5-400° F. natural gasoline	32	40	65
Light gasoline removed, total C_5-400° F. natural gasoline	68	60	35
Yields, L.V. per cent of C_5-400° F. natural gasoline:			
Total C_4-end point platformate	30.6	37.7	61.5
Light gasoline	68.0	60.0	35.0
Outside butane to reach 10.0-lb. R.v.p.	4.3	2.8	0.8
Total 10.0-lb. R.v.p. final gasoline blend	102.9	100.5	97.3
Octane numbers of 10.0-lb. R.v.p. final gasoline blend:			
Research method (F-1):			
+3.0 ml. TEL/gal.	88.0	90.0	92.0
Clear	67.3	71.2	74.8
Motor method (F-2):			
+3.0 ml. TEL/gal.	86.2	87.6	89.0
Clear	66.3	69.5	72.5
Octane numbers of reactor feed:			
Research method (F-1):			
Clear	18	27	35
+3.0 ml. TEL/gal.	47	54	63
Octane numbers of light gasoline removed:			
Research method (F-1):			
Clear	65.0	66.5	75.5
+3.0 ml. TEL/gal.	87.0	88.0	94.5
Octane numbers of total C_4-end point platformate:			
Research method (F-1):			
Clear	66.0	75.5	75.0
+3.0 ml. TEL/gal.	88.0	91.2	90.7



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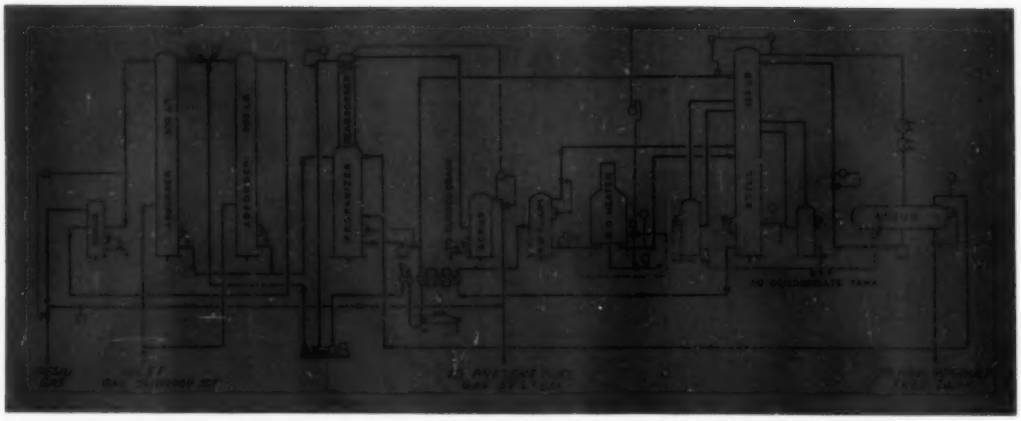

Flow diagram—La Gloria casing-head plant, La Gloria Corp., Falfurrias, Tex.

La Gloria Plant Gets Three Major Additions in 9 Years

by Homer C. Givens*

SINCE La Gloria Corp.'s pressure-maintenance and natural-gasoline (cycling) plant started operating in the middle of 1941, it has had three major additions.

It started with a capacity of approximately 210,000,000 standard cubic feet of gas per day. This entire amount of gas came from a 4,550-acre unitized block known as the La Gloria unit and a 1,500-acre tract unitized as the South La Gloria unit. The unitizing covered all gas-distillate sands underlying these blocks and cycling was started in four sands. All sands have a flowing pressure of approximately 2,400 psig. which now is only about 20 psi. below what it was when cycling started 10 years ago.

The producing wells are around the edge, and the injection wells in the center of the unit. Each zone's gas, both produced and injected, had to be accounted for separately. To save expense in drilling, all wells are dual completions except one injection well which is a triple completion.

First Addition to Project

Early in 1942, several gas-distillate wells were drilled outside the units and in sands that were not found under the units. These were mostly small sands that economically did not justify cycling. At that time, compressors were added to inject all the unit gas after extracting the pentanes and heavier fractions, 50 per cent of the butanes, and 35 per cent of the propane. The gas from the "off unit" wells was used as plant fuel and for several small gas sales.

At the end of 1942, the plant was processing daily 255,000,000 standard cubic feet of gas. From this was extracted and saved per day, 100 bbl. of propane, 480 bbl. of isobutane, 500 bbl. of N-butane, 3,500 bbl. of 91-octane aviation-base gasoline, 800 bbl. of naphtha, 1,000 bbl. of kerosine, and 100 bbl. of absorption oil and residuum.

The gas came to the plant under approximately 1,950 psig. (now declined to 1,750 psig.) and 128° F., and was cooled in a cooling tower to 95° F. The pressure was then reduced to 1,500 psig. and due to this expansion was cooled to 80° F. The gas, after pressure reduction, split to two separators where the retrograde condensate was collected along with any salt water that came in.

Retrograde condensate amounted to one-half the liquid production, and the remainder was absorbed in three absorbers operating at a pressure of 1,500 psig. The compressors took suction directly from the absorbers, and compressed the gas to 3,000 psig. which was required for injection.

Rich oil from the 1,500-lb. absorbers and the condensate were flashed at 250 psig. and the vapors passed through a reabsorber at that pressure. They were also flashed at 80 psig. and another reabsorber operated at that pressure. The oil then passed through heat exchangers and a direct-fired heater and to a still where the gasoline fractions were stripped from the oil.

The still gasoline and condensate mixed in the raw feed tank. From there the mixture was fed to a primary column and pentanes and lighter were taken overhead. This material was fed to a depropanizer, with propane overhead, and bottoms to a debutanizer. The butanes overhead went to a butane splitter. Pentanes from the bottom mixed with the gasoline overhead from the final column which operated on bottoms from the primary column. This product was the 91-octane aviation-base material. There also were two side-drawoff streams, one being naphtha and the other kerosine. Absorption oil

*Plant superintendent, La Gloria Corp., Falfurrias, Tex.

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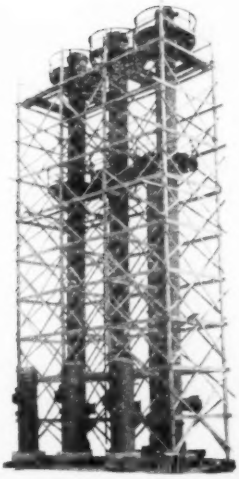

SATISFIED by the operation of Koch Kaskade trays in another of their gasoline plants, Peppers naturally specified them in all the towers of their new gasoline plant at Britton, Oklahoma. These towers include an absorber, stripper, deethanizer, depropanizer and a debutanizer.

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and residuum came from the bottom.

Second Large Plant Addition

Soon after January 1, 1945, the second big addition was started. A fourth high-pressure absorber and a 600-psi. flash on the rich oil and distillate was added in the absorption system. The 600-psi. reabsorber was also large enough to handle 35,000,000 standard cubic feet of gas daily in addition to the flashed gases. The residue gas from this absorber supplies fuel to the Celanese Corp. of America plant at Bishop, Tex. Lean-oil fuel to the high-pressure absorbers was increased from 4 to 9 gal. per thousand cubic feet of gas. These changes, by increasing the propane and butane extraction, reduced the percentage of condensate to final production from 50 to 33 per cent.

In the distillation and fractionating system, a larger still, new oil heater, new and larger primary column, new depropanizer, and new cooling tower were added. The existing still was run in parallel with the new one and the existing depropanizer was converted to a deethanizer. Also, the existing debutanizer was changed over to a gasoline fractionator.

Soon after this addition was completed, 305,000,000 standard cubic feet of gas was being processed daily, and 54 per cent of the propane, 80 per cent of the butanes, and all of the pentanes and heavier fractions were extracted and saved.

Third Addition, "Casing-head" Plant

Early in 1946, several oil-producing sands were discovered. Most of these sands were not in the units; however, some of them extended under the South La Gloria unit. By 1948 the gas from these wells was reaching a volume that demanded consideration for conservation purposes. In June 1949 this volume averaged 29,000 M.c.f. per day.

Very early during January 1949 La Gloria Corp. started construction of a plant known as the "Casing-head Gasoline Plant." Although it is inside the fence which encloses the cycling plant, it is constructed and operated, to the point of production of raw casing-head gasoline, as a separate and distinct plant. The compressor section of the plant started operating the first week of June 1949, and the absorption and distillation section the following December.

The casing-head gas is gathered in a pipe-line system ranging in size from 2 to 26 in. Total length of the system is about 33 miles.

Terminal of the gathering system is near the compressor house, where a reducing regulator (diaphragm-motor-operated butterfly valve) is installed to hold a constant pressure of approximately 10 psia. on the compressor suction head. Pressure on the gathering system, just ahead of the reducing regulator, is controlled to approximately 13 psia. This is accomplished by an ordinary pressure recorder-controller which operates a piston motor actuating the governors of the compressor engines.

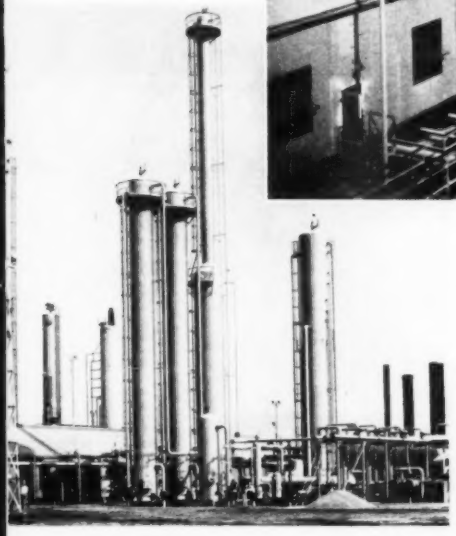
The compressor plant consists of nine 800-hp. right-angle gas-engine units. They compress the gas from the 10 to 325 psia. in three stages with intercoolers between first and second stages and between second and third stages, and third stage aftercooler.

Compressor engine-jacket and compressor cylinder-cooling water is cooled in radiator-type coolers. The temperature of the water to the engine jackets is controlled to 140° F. by a temperature recorder-controller operating a bypass valve between the water from and water to the engines.

An unusual feature of the compressor plant is that for each compressor the suction pipes, volume chamber, and discharge pipes comprise a pulsation dampener. This is very effective, apparently better than 90 per cent efficient.

The gas is metered by two orifice meters in the lines between the two first-stage discharge scrubbers and the second-stage suction header. The metering is done at this point for two reasons: first, the inlet lines to the first stage suction header are 26-in. pipe and orifice runs of this size would be very expensive; and, second, they would have to operate at a vacuum which if possible is to be

(Continued on page 203)



Right: View from top of "casing-head" cooling tower showing major portion of both the cycling and the natural-gasoline plants.
Below: View of "casing-head" distillation unit. The building (lower left) is control and pump house for its cycling plant. Three towers on left, starting with tallest back of floodlight tower, are: butane splitter; No. 2 gasoline fractionator; and No. 1 gasoline fractionator.

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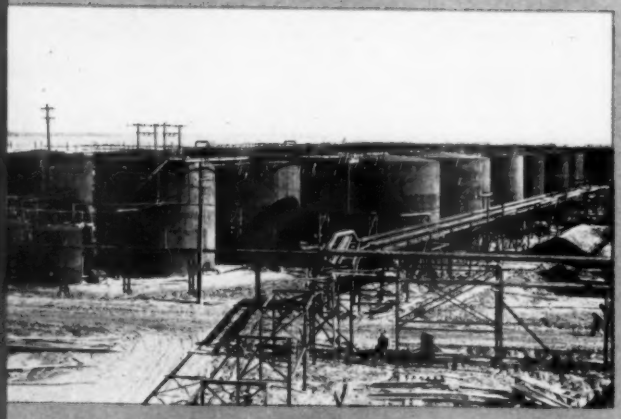

Part of the 103 miscellaneous size welded tanks and overhead piping erected under one contract for a large Gulf Coast Oil company.

This 117' diameter pan type floating roof tank constructed for a major Gulf Coast refining company. Galvanized shoes are in foreground.

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Plant Production of L.P.G. Soars Above That of Natural Gasoline

by John C. Casper
District Editor

OPERATORS of natural-gasoline and cycling plants started out the year 1950 with the highest production in history. January output averaged 20,407,000 gal. daily for an increase of 16 per cent over January 1949. Daily average production of L.P.G. gained 25 per cent but natural gasoline and other products increased only 10 per cent.

However, it is not expected that this rate of increase will be maintained throughout 1950 even with potential capacity almost 30,000,000 gal. daily. Production may be limited by potential demand rather than potential capacity.

Another record was established in January. For the first time, plant production of L.P.G. exceeded that of natural gasoline. L.P.G. output averaged 8,599,000 gal. daily compared wih 8,381,000 gal. daily for natural. This is the result of a trend that has existed since L.P.G. production statistics were first collected in 1941. In that year, natural production was more than three times the output of L.P.G. but had dropped to less than twice as great by 1944 and was only 1 per cent greater in December 1949.

Texas accounted for 50.6 per cent of total natural-gasoline and cycling-plant production in January compared with 49.4 per cent for the year 1949. This was balanced by a slight drop in the relative position of California. The ratios for Louisiana and Oklahoma were unchanged from the 1949 average.

1948 Most Profitable Year

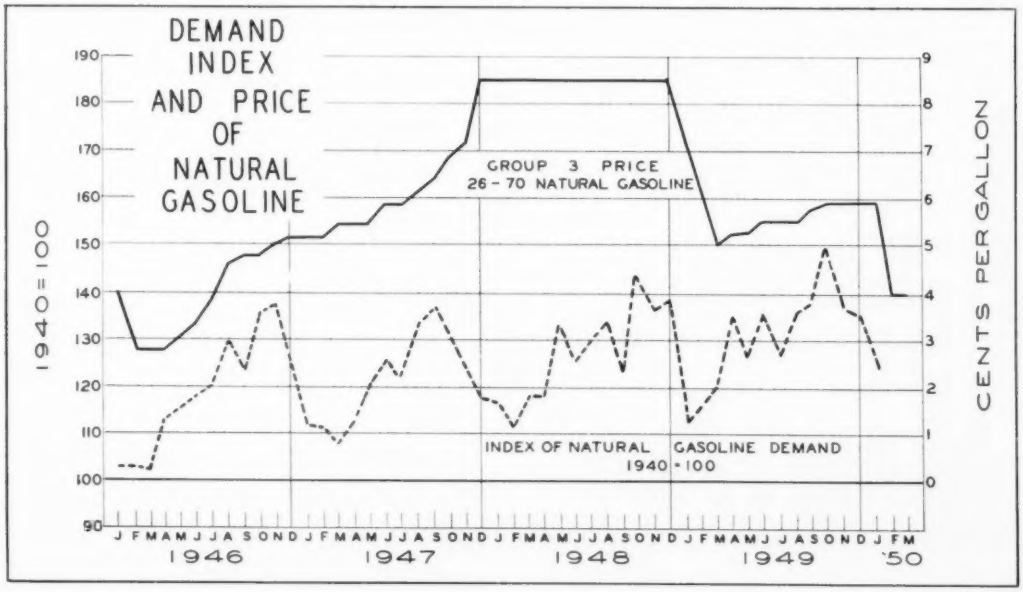
The light-hydrocarbon portion of the petroleum industry had its most profitable year in 1948. Total value of plant products for that year was estimated at $463,618,000 by the Bureau of Mines. Despite a production increase of 6.8 per cent for 1949, the total value dropped to $387,000,000 because of decreases in unit prices.

The postwar price-demand relationship for natural gasoline is shown on an accompanying chart. Group 3 prices for 26-70 natural, expressed as cents per gallon, are plotted with an index of natural-gasoline demand, calculated with the average for 1940 equal to 100. It will be noted that the low point for any given year comes in the first quarter.

The decrease in January 1949 was more pronounced than in an average year. This sharp drop in demand resulted in abnormal stock increases which in turn produced the weak market shown by price decreases amounting to 3.5 cents a gallon in the first quarter. The same series was repeated this year on a smaller scale with the decline starting in November. Seasonal decreases in the early months of 1947 and 1948 did not affect price because of the general petroleum shortage that lasted until the middle of 1948.

The other chart with demand index lines for natural gasoline and motor fuel indicates that motor-fuel demand has been increasing faster than natural-gasoline use. At least part of this relative loss by natural is due to the postwar octane race. The lower octane number for clear natural gasoline has caused it to be replaced in some instances by refinery-produced light material with a higher octane value.

The general decline in natural-gasoline price level since the end of 1948 has forced more plant operators into the finished-gasoline market. A



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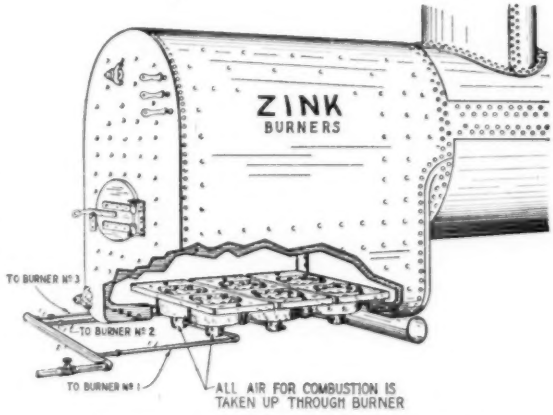

Shows typical installation of John Zink Vertical Bi-Mix Burners in locomotive type boilers.

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much larger percentage of total plant output is now being blended into motor fuel and sold as recycle gasoline. Production of finished gasoline and naphtha in December and January of this season gained 31 per cent over the same months a year earlier.

Even though this gasoline sells for 1 cent to 1.25 cents per gallon less than the low of the Group 3 market, it may be a more profitable item than 26-70 natural at 5.375 cents under the Group 3 low.

Daily average production of finished gasoline and naphtha by natural-gasoline and cycling plants in December and January was reported by the Bureau of Mines at 52,000 bbl. daily. Since the average demand for all gasolines in the same period was 2,353,000 bbl. daily, recycle demand supplied about 2.2 per cent of the total. However, the effect of this relatively new source of motor fuel is greater than its ratio to total demand. Most of the recycle is marketed in competition with refinery produced gasoline in the Group 3 area.

Finished recycle gasoline normally has very little "jump" or difference in octane numbers determined by A.S.T.M. motor method and research method. The same grade of gasoline that once met the requirements for premium gasoline by the A.S.T.M. method now is marketed as regular grade on the research basis.

Increased production of this gasoline has had a decided effect on gasoline markets in the Mid-Continent and North Central areas. Since most of the material moves at a cent or more under the Group 3 low and in many cases is transported up to the Mississippi at relatively low barge rates, it enters the North Central markets at a cost level that is low enough to permit considerable price cutting at service stations.

This gasoline could take its place in the normal gasoline-distribution pattern if the octane rating were raised, and many suppliers believe that this is the probable solution to the problem. It is known that the octane can be improved by Platforming or some reforming operation, but it will take time to install the necessary equipment. Since this same general problem confronts the users of natural gasoline, the octane race may force some form of processing for almost all of plant production that goes into motor fuel.

Two Main Factors

The over-all problem in the distribution of natural-gas liquids has two main factors. Storage costs are high and the ratio of available storage to total demand is low. Also, total demand varies widely with the seasons.

Total stocks of crude and products at the end of January represented about 90 days' supply and refined products about 51 days' supply, based on total demand in January. On the other hand, stocks of products from natural-gasoline and cycling plants, located at both refineries and plants, amounted to only 15 days' supply. Demand in the peak month of 1949 was more than 20 per cent greater than the low month and the actual difference in demand for the 2 months was 43 per cent of total reported light stocks at the end of the year. It is this inability to store excess products during the low-demand seasons that depresses the light-product market.

Production flexibility is limited by the close association with crude production and also by gas-delivery commitments. Since output cannot be reduced to the level of the low-demand months, further study of the storage problem may increase the stability of this important section of the petroleum industry.

TABLE 1—PRODUCTION BY NATURAL-GASOLINE AND CYCLING PLANTS

(Thousands of gallons daily)

	Nat. gasoline	L.P.G.	Other products	Total	Per cent increase
1941	6,050	1,938	1,316	9,304	
1942	5,674	2,119	1,794	9,587	3.0
1943	5,796	2,495	1,802	10,093	5.3
1944	5,979	3,198	2,303	11,480	13.7
1945	6,846	3,872	2,170	12,888	12.3
1946	7,372	3,861	2,085	13,318	3.3
1947	7,517	5,183	2,509	15,209	14.2
1948	8,141	6,036	2,660	16,837	10.7
1949	8,240	6,626	3,108	17,974	6.8
Jan. 1947	6,973	4,996	2,353	14,322	
Jan. 1948	7,342	6,261	2,651	16,254	13.5
Jan. 1949	7,618	6,875	3,102	17,595	8.3
Jan. 1950	8,381	8,599	3,427	20,407	16.0

TABLE 2—PRODUCTION OF NATURAL GASOLINE AND CYCLE PRODUCTS BY STATES

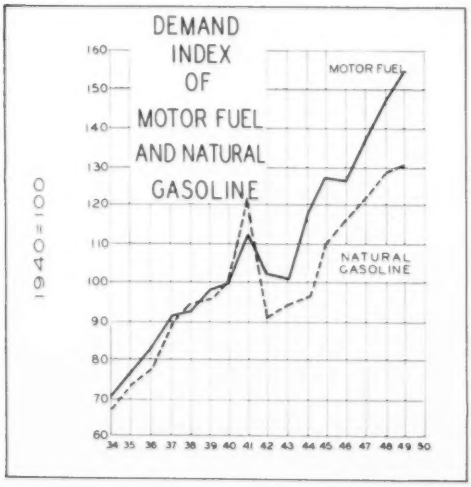
(Thousands of gallons daily)

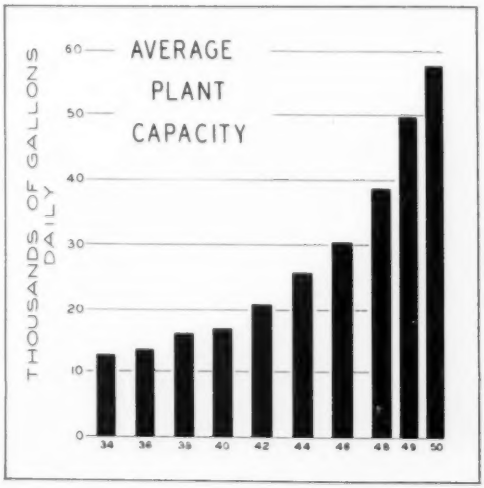
	Texas	Calif.	La.	Okla.	Other	Total
1941	4,272	1,807	618	1,242	1,365	9,304
1942	4,295	1,735	811	1,219	1,527	9,587
1943	4,510	1,899	839	1,157	1,688	10,093
1944	5,108	2,107	1,346	1,152	1,767	11,480
1945	5,995	2,443	1,505	1,140	1,805	12,888
1946	6,255	2,494	1,553	1,137	1,879	13,318
1947	7,231	2,915	1,723	1,223	2,117	15,209
1948	8,275	3,047	1,939	1,283	2,293	16,837
1949	8,877	3,116	2,093	1,452	2,436	17,974

TABLE 3—LIGHT PRODUCT STOCKS AT PLANTS AND REFINERIES, END OF JANUARY

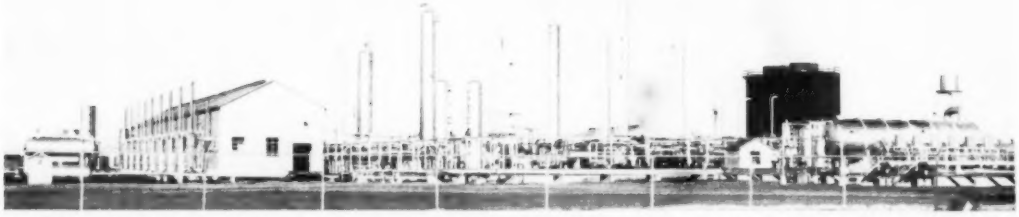
(Thousands of gallons)

	Natural gasoline	L.P.G.	Other	Total
1945	110,246	42,706	21,781	174,733
1946	129,508	42,175	39,742	211,425
1947	137,134	26,856	37,338	201,328
1948	119,227	31,741	30,584	181,552
1949	170,121	46,382	44,629	261,132
1950	191,137	53,183	64,929	309,249





STANOLIND STARTS OPERATION OF 3 NEW PLANTS



LEVELLAND GASOLINE PLANT.—Located 3 miles west of Levelland, Hockley County, Texas. This plant has a capacity of 40 million cubic feet daily and draws casing-head gas from 890 wells in Levelland field. Major sections of the plant visible in this picture are, from left, the compressor building, process area, cooling tower and inlet gas scrubber.

Levelland gasoline plant.—Another in the series of conservation projects in West Texas has been completed with the startup of Stanolind Oil & Gas Co.'s Levelland gasoline plant. The plant is in Hockley County about 3 miles west of the city of Levelland.

The plant began first-phase operations last November, when the compressor installation was completed. Gas was compressed, sweetened, and dehydrated, and the compression condensate was shipped to the nearby Slaughter plant to be rerun and stabilized. In January of this year, the absorption, distillation, and fractionation sections of the Levelland plant were completed and the plant began making products on January 11.

The Levelland absorption-type gasoline plant has a design capacity of 40,000,000 standard cubic feet daily. Operating at capacity, it recovers 130,000 gal. of liquid products daily, including 60,000 gal. of 12-lb. natural gasoline, 30,000 gal. of propane, and 40,000 gal. of butane. The plant is designed to recover approximately 50 per cent of the propane, 98 per cent of the butane, and essentially all of the natural-gasoline components.

Residue gas, amounting to some 30,000,000 standard cubic feet daily, when the plant is running at capacity, is sold to El Paso Natural Gas Co. for transmission to metropolitan areas in the West.

Absorber Operates at 713 Psi.

Gas is taken from some 890 wells in Levelland field, entering the plant at from 2 to 4 psi. It is compressed to 718 lb. in three stages, passing through an amine unit for removal of hydrogen sulfide gas between the second and third stages of compression. The compressor installation contains nine Ingersoll-Rand KVG 1,200-hp. gas-engine-driven compressors.

The single absorber operates at a pressure of 713 psi. The absorber is a 25-tray vessel, 55 ft. high by 5 ft. 6 in. in diameter. Residue gas is scrubbed and dehydrated before entering the sales and plant-fuel lines.

Rich oil from the absorber passes through exchangers and the still preheater to the high-pressure still, which operates at a pressure of 220 psi., top temperature of 205° F., and bottom temperature of 445° F. Bottoms from the high-pressure still are flashed to the low-pressure still. This vessel operates at 60 psi., 225° F. top temperature, and 420° F. bottom temperature.

Both stills are 4 ft. 6 in. in diameter by 56 ft. high, with 22 trays. The still preheater is a new type Born direct-fired heater, in which the air is preheated before entering the combustion chamber. The heater has a capacity of 10,328,000 B.t.u.'s per hour.

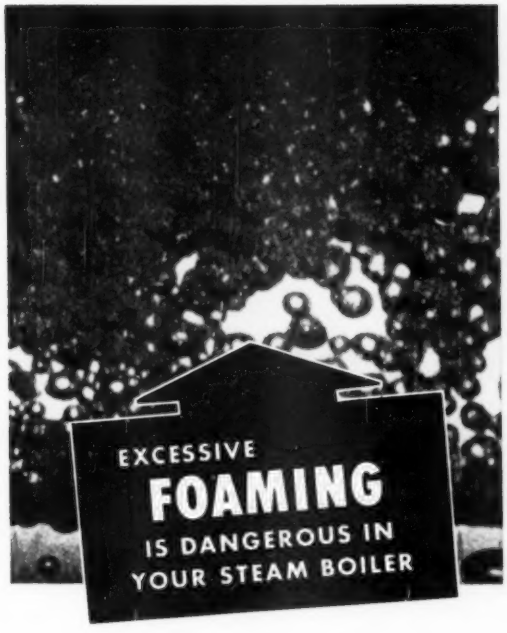
Fractionation Equipment

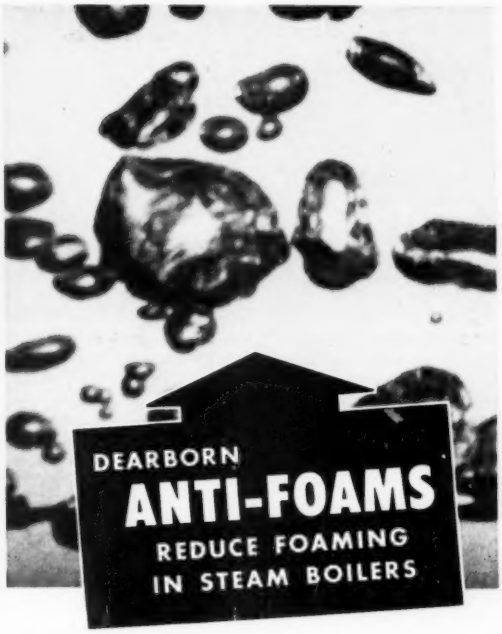
Fractionation equipment includes deethanizer, depropanizer, and debutanizer towers.

The deethanizer is a 25-tray vessel, 42 in. in diameter by 58 ft. high. Deethanizer bottoms are charged to the depropanizer. This is a 78-ft. column, 42 in. in diameter, equipped with 35 trays. Overhead is condensed, treated, and piped to storage as propane. The debutanizer takes its feed from the depropanizer bottoms. It is a 30-tray vessel, 48 in. in diameter by 68 ft. high. Overhead is condensed, treated, and stored as butane. Debutanizer bottoms are 12-lb. R.v.p. natural gasoline. This is caustic washed, sweetened in Perco treaters, and piped to storage.

Storage facilities include twelve 715-bbl. cylindrical tanks, four each for butane, propane, and gasoline

SOUTH FULLERTON GASOLINE PLANT.—Located 17 miles northwest of Andrews, Tex., Andrews County. Plant capacity is 38 million cubic feet daily. Gas is drawn from 65 tank batteries in South Fullerton field. Plant is operated by Stanolind Oil & Gas Co. for the group of owners. View shows process area, with compressor building in the background. Quonset hut at extreme right is a temporary construction building and will be removed.





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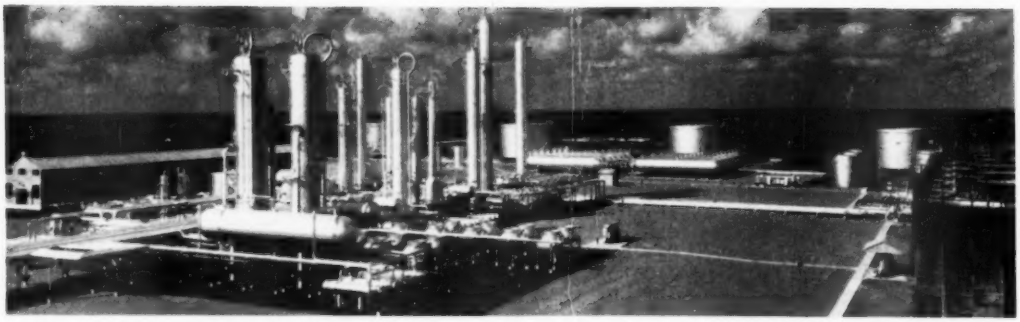

BURNELL-NORTH PETTUS CYCLING PLANT.—View is from top of water-storage tank. Compressor building is at extreme left, process area is in center, cooling tower is in extreme right with product storage area in the background. Plant is located 5 miles northeast of Pettus, Tex. Stanolind Oil & Gas Co. operates the plant for the group of owners.

An 18-car loading rack, with nine spots to each side, is provided for tank-car loading of products. There is also a two-spot truck-loading station.

Utilities are provided as follows: Steam is generated by three Wicks boilers, each with a capacity of 8,600 lb. of steam per hour. Electricity for plant and camp use is supplied by three 250-kw., 440-volt, 3-phase, 60-cycle generators. Water needs are provided by three wells, all near the plant but not actually on the plant site. Pumping capacity of the three wells is about 375 g.p.m.

Contractor on the job was Brown & Root Construction Co., Inc., Houston.

Stanolind Oil & Gas Co. operates the plant for the group of owners, which includes, besides Stanolind, The Texas Co., Magnolia Petroleum Co., Mid-Continent Petroleum Corp., Tide Water Associated Oil Co., Superior Oil Co. Skelly Oil Co., Maracaibo Oil Exploration Corp., Cobb & Watson, and Ralph Lowe.

South Fullerton plant.—This new gasoline plant lies in the center of a 90-acre site 17 miles northwest of the city of Andrews, Tex. The plant operates on gas drawn from 65 tank batteries in Fullerton field—a pool about 13 miles long and 5 miles wide. The plant's operating capacity is 38,000 M.c.f. per day.

Gas comes into the plant through two 24-in. lines at a pressure of 2 psi. The gas is put through three stages of compression, cooling, and scrubbing before it enters the main absorber at a pressure of 700 psi. Between the second and third stage, both gas and condensate are sweetened in a vapor contactor by a solution of monoethanolamine.

Discussion of Process Equipment

Lean oil from a surge tank is pumped into the top of the absorber. The rich oil from the bottom of the absorber goes into a rich oil flash tank and on to a six tray rich-oil absorber operating at about 225 psig. and 111° F. From this absorber it moves to a surge tank, then through oil-to-oil heat exchangers into a hot-oil vent tank. From this tank it goes to a primary still furnace and on to a 20-tray primary still operating at about 237 psig. with a 160° F. top temperature.

The primary still removes the light hydrocarbons. Oil leaving the bottom of this still goes to a secondary still operating at a pressure of 72 psig. with a top temperature of 250° F. Here the remaining absorbed hydrocarbons are removed. The lean oil from this still is used in three ways: (1) moved to the oil reclaimer for purification, (2) moved through a tube bundle to supply heat for the oil reclaimer, and (3) moved through the oil-to-oil heat exchangers and the lean-oil coolers and returned to the lean-oil surge tank.

The plant uses a 29-tray deethanizer which operates at approximately 110° F. top temperature, 224° F. bottom temperature, and a pressure of 460 psig. It has a 40-tray depropanizer operating at about 248° bottom temperature and a pressure of 240 psig. The plant's 36-tray debutanizer operates at about 260° F. bottom temperature and a pressure of 115 psig.

Seven Clark type BA-8 2-cycle, 1,600-hp. gas-engine-driven compressors and one Clark type RA-4 2-cycle 400-hp. compressor for the recycle gas, make up the compressor facilities.

Equipment for Utilities

Steam for processing and power needs is generated by three gas-fired, induced-draft, Babcock-Wilcox water-tube boilers. Each boiler has a design delivery rate of 40,000 lb. of steam per hour at 400 psig. pressure and 700° F.

The electrical system of the plant consists of three 500-kw., 480-volt, 3-phase, 60-cycle Elliott generators. Each generator is directly connected to a JS-8-G Cooper-Bessemer eight-cylinder four-cycle gas engine.

Water for the plant and adjoining facilities is supplied by three wells. The wells have a maximum producing rate of 900 g.p.m.

The gas leaving the absorber is used as plant and camp fuel, lease fuel, and sales gas. Sales and residue gas is dehydrated by a florite dehydrating system.

Four horizontal butane tanks, and six horizontal propane tanks—each with a 1,375-bbl. capacity—provide storage for these products at the plant. Natural gasoline is stored in three 2,500-bbl. spherical tanks.

Most of the plant's daily production of 40,000 gal. of propane, 25,000 gal. of gasoline, and 35,000 gal. of butane moves by pipe line or is piped to the rail-loading rack at Eunice, N. M., 20 miles west of the plant. A part of the L.P.G. production is shipped out by trucks, loaded at the plant.

Constructed by Jones & Laughlin Supply Co., the plant is operated by Stanolind Oil & Gas Co. for the group of owners. Other owners besides Stanolind are: Mid-Continent Petroleum Corp., Texas Pacific Coal & Oil Co., Superior Oil Co., Gulf Oil Corp., The Texas Co., Anderson-Prichard Oil Corp., Elizabeth F. Frankel, British-American Oil Co., Bay Petroleum Corp., Pearl Frankel, Champlin Refining Co., Paul F. Barnhart, Donald Frankel, and Harding Frankel.

Burnell-North Pettus cycling plant. This new operation of Stanolind Oil & Gas Co., for itself and a group of owners, handles more gas than any of the other gasoline or cycling plants operated by Stanolind.

The installation, which is located 5 miles northeast of Pettus and 80 miles from Corpus Christi, processes gas produced chiefly from condensate wells in Burnell and North Pettus fields. Its daily capacity is now 166 million cubic feet, of which 159 million feet is wet gas from condensate reservoirs.

Production is more than 330,000 gal. of liquid fuels daily. About half of this gallonage is gasoline. Other products include butane, propane, kerosine, and fuel oil. Besides liquid products, the plant also sells 30 million cubic feet of gas daily for use as a fuel in nearby cities.

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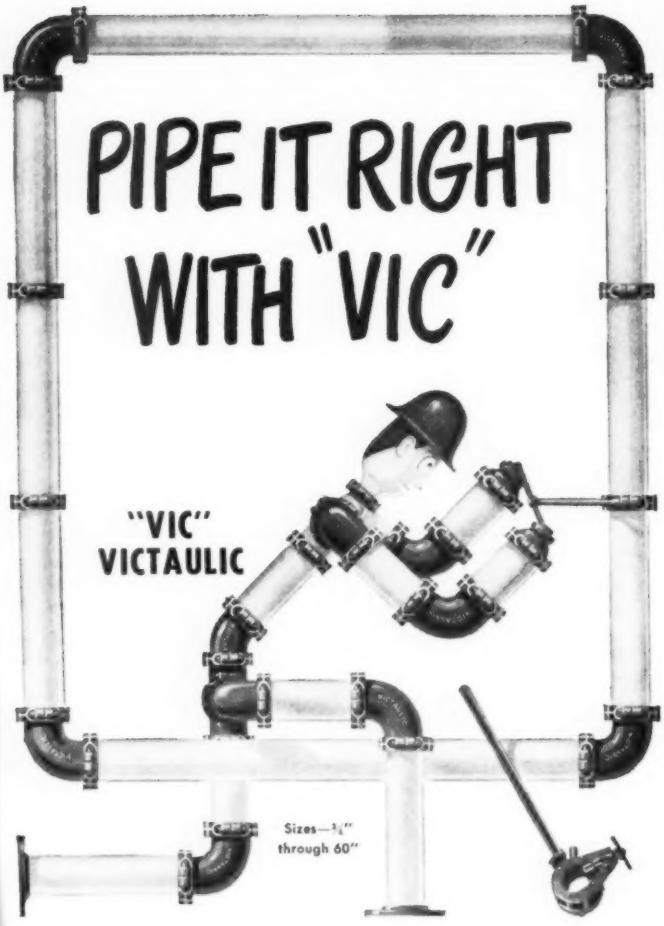

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Storage and Transportation

(Continued from page 172)

tributing areas during 1946-47 caused public utilities and others to turn to liquefied petroleum gases to augment their available natural-gas supply. Immediately there was concern over establishing tank farms of 20 to more than 100 tanks, each filled with liquid propane. The total energy concentrated in a limited area presented a substantial fire hazard.

Fortunately, careful planning has brought most of these large storage facilities through 1949 and into 1950 with little or no difficulty. No major catastrophe has been recorded although there have been a few fires and a small number of casualties in plants used to store and furnish propane for utility and industrial use.

However, with the extension of existing storage to larger and larger quantities—many times in an area of concentrated population—there is a potential danger which looms just as large as that attributed to liquid methane storage.

But, with the results obtained thus far for the Methanite storage process, it would seem that a greater degree of safety is available and assured for future tank farms. It also would seem likely that the process can be further developed so that these light-hydrocarbon fuels would no longer have to be transported in pressurized vessels—in a liquid form.

Additional Applications

If the Methanite method works satisfactorily for aboveground permanent storage, it would seem entirely logical for a similar Methanite system to be incorporated in the design of railroad cars, ocean tankers, and river barges.

It is visualized that for barge or tanker service the Methanite adsorbent could be arranged in steel boxes or other containers of convenient shape. These boxes would be gastight at a low gage pressure, vented to a pipe header, and insulated on the inside. They would be charged at the shipping terminal, for example with propane at its boiling temperature of —44° F.

During transport there would be some heat leak through the fireproof insulation into the Methanite adsorbent carrier. This would result in the desorption or release of a small amount of propane vapor which would be taken away through the vent system to the fuel use.

This release would be proportionately quite small to the total being transported. The cause would be due to the insulating quality of the porous Methanite adsorbent. This would be cumulative. It does not appear practical to provide and operate refrigeration equipment to overcome the probable heat leak.

At the delivery terminal the adsorbed propane would be removed from the Methanite by circulating warmer propane vapor through the containers. This could be done on a barge or ship, or the containers could be removed to a shore installation for the desorption step. The propane vapors so removed would be pressurized and condensed by conventional means.

If butane were being transported in this manner, its lower boiling point of +31° F., not being so great a differential from atmospheric temperature, would result in less heat leak. Therefore, there would be less vapor release.

It is doubtful that the above-described transportation method could be extended to railroad cars because of the lack of any apparent practical way to dispose of the vapors desorbed by the heat leak. The practical application to rail transportation would be to install the Methanite adsorbent in conventional pressure tank cars. During transport to the consignment point there would be some increase in pressure. The considerable difference would be the much smaller fire hazard in case of a major rail accident.

As an alternate, the same pressure-storage method with adsorbents could be applied to tankers and barges to avoid vapor release. The safety factor during transportation would be much

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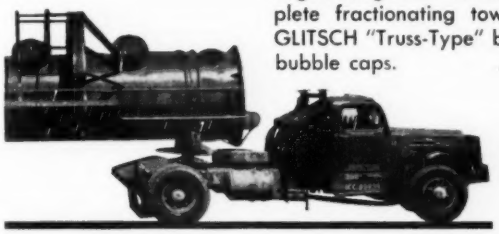

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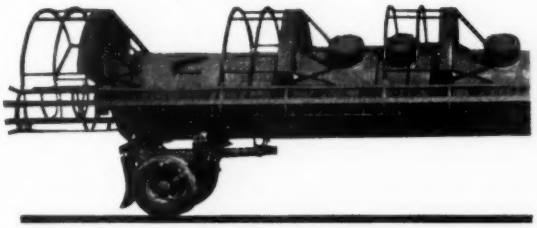

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greater than for conventional liquid propane shipment.

Progress reports on this Methanite system of handling propane, butane, and related hydrocarbon fuels, and a more complete account of pilot-plant operations, will be published at a later date.

Platforming

(Continued from page 178)

creased demand for high-octane gasoline. The result was that during 1948 and 1949, the over-all octane number of produced gasoline has increased by approximately one unit per year. It seems evident that this trend will continue.

Straightrun gasoline, which has a leaded research octane number varying from 50 to 83, depending on its source, has been processed to a greater or lesser extent over the past 20 years by various methods such as thermal reforming plus polymerization, polyforming, desulfurization, and hydroforming. Approximately 35 per cent of the straightrun produced is presently processed for major octane number improvement. These methods have been fairly expensive due to the loss of considerable amounts of product to components more volatile than gasoline.

Platforming of straightrun gasoline provides a more economic method for the production of gasoline of an octane number in approximately the same range as catalytic cracked. Platforming has also been shown able to process thermally cracked gasoline to produce a stable product of about the same octane level as is obtained when platforming straightrun gasoline. The use of a catalytic cracking unit or a platforming unit with thermal cracking in a refinery depends on the heating and residual fuel oil situation, together with the octane requirements which exist in the locale of the particular refinery.

A summary of the gasoline trend as we see it at this time indicates (1) increasing supplies of high-octane gasoline by oil refiners from catalytic cracking and platforming and (2) increasing supplies of total gasoline due to limitations of the heating-oil markets and the production of increasing supplies of natural gasoline which must be sold because they are a necessary product of the expanding natural gas-natural gasoline industry.

Platforming of Natural Gasoline

Application of the Platforming process for the improvement of natural gasoline requires a somewhat different mode of operation from that necessary for straightrun gasolines. These changes in mode of operation are primarily due to the fact that the boiling range of the two types of stocks are not the same.

It is recognized that the term natural gasoline usually applies to a stock having a Reid vapor pressure of 26

psia. or less and maximum end point of approximately 375° F. The data which will be discussed later have been obtained by processing various fractions of this material. However, we would also like to discuss the application of the Platforming process to that fraction of the total liquid recovered from any of the types of wells producing natural gas. At the present time, liquids from natural-gas wells with A.S.T.M. distillation end points above 410° F. have not been processed. Neither has it been found that there are any particular advantages in processing butane as the improvement is not sufficient to warrant its inclusion in the feed stock.

Henceforward when natural gasoline is referred to, a debutanized natural with an end point of 400°-410° F. is meant, as that appears to be the fraction which is subject to the greatest improvement by the Platforming process. This fraction of the liquid product from most gasoline plants already has a comparatively large amount of material boiling below 212° F., and it is felt that the improvement in its octane rating must be accomplished with a minimum increase in the amount boiling below 212° F.

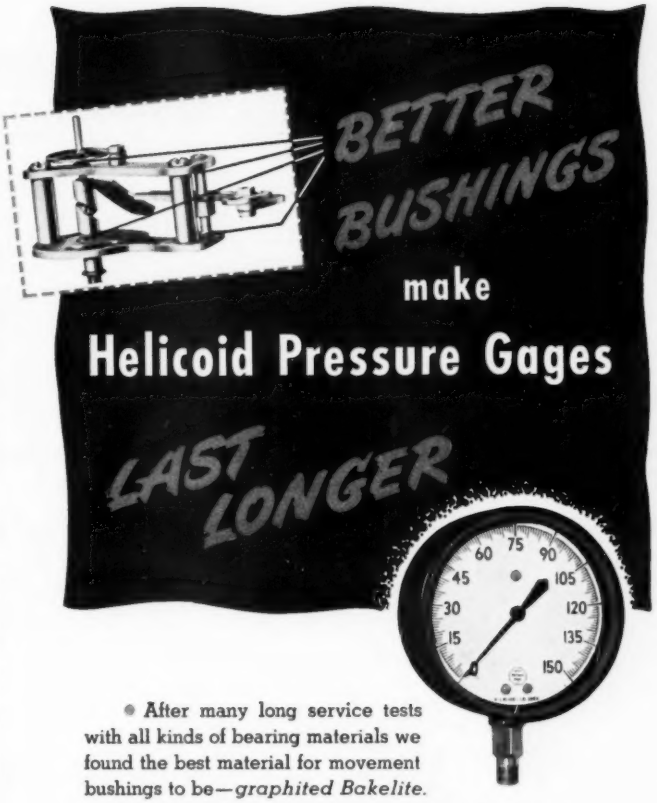
The usual specification requires that the 50 per cent point of a gasoline shall not be less than approximately 200° F. This specification is designed to minimize vapor lock and percolation difficulties. Actually, the amount boiling below 200° F. is not a very good measure of a fuel's tendency to vapor lock or percolate, and a better measure is the combination of the vapor pressure and the average slope of the distillation curve up to the 50 per cent point.

It is only necessary to drop the vapor pressure slightly to compensate for rather marked changes in the slope of the distillation curve and still maintain a perfectly satisfactory fuel from the standpoint of percolation and vapor lock. In view of the fact that the natural-gasoline manufacturer desires to sell as much butane as possible as motor fuel, it still remains the aim of the Platforming process to make as slight a reduction in boiling range as possible.

Due primarily to the fact that a considerable portion of natural gasoline boils at a fairly low level, it has an over-all octane number which is higher than most straightrun gasolines obtained from crude oil. The extent which the fuel must be improved is less and the amount of material which must be processed to accomplish this objective is less. It may also be stated that the maximum octane number which can be reached, before the slope of the yield-octane curve is reduced to an uneconomical level, is lower.

Platforming Process

Platforming is a nonregenerative catalytic reforming process by which



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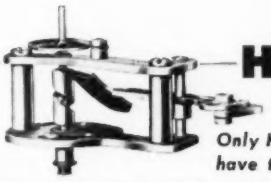

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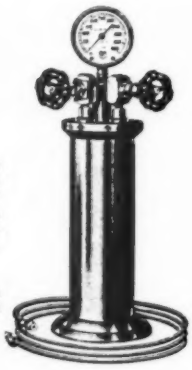

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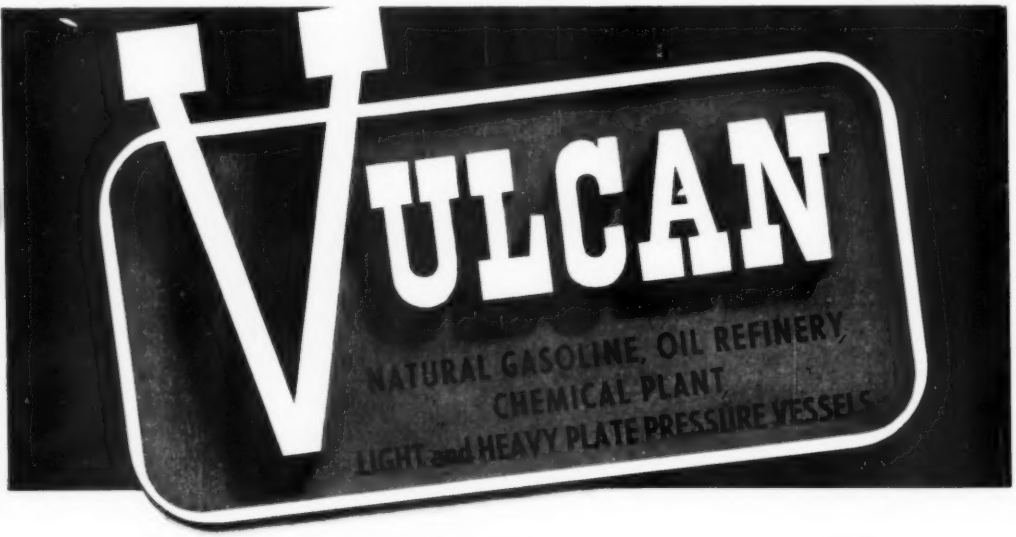

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straightrun and natural gasolines are reformed at high liquid volumetric recovery in the presence of a platinum catalyst in a hydrogen atmosphere, to obtain high-octane-number products. This result is accomplished by utilizing the combination of four principal reactions.

It is the purpose of this article to point out the application of Platforming to natural gasolines; therefore, the chemistry of the process and the effect of the major operating variables, which have been discussed in some detail in another paper,* will only be reviewed here.

Reactions and Operating Variables

The four principal reactions undergone in Platforming are dehydrogenation of naphthenes to aromatics, hydrocracking of high-molecular-weight paraffins to lower-molecular-weight paraffins, isomerization of paraffins and of naphthenes, and desulfurization of sulfur compounds forming hydrogen sulfide. While the aromatization reaction causes volumetric shrinkage, the hydrocracking reaction leads to volumetric expansion and is therefore offsetting. All the reactions in Platforming lead to octane-number improvement.

Selectivity of the reactions for a given feed stock is accomplished by control of the four major operating variables and by catalyst composition and preparation. Temperature, space velocity, (volume of feed per unit time per unit volume of catalyst) pressure and hydrogen-rich gas recycle rate are the chief operating variables. It is the hydrogen atmosphere in the reaction zone and the selectivity of the catalyst which make the process nonregenerative by prevention of formation of materials that lead to catalyst deposits. Platforming produces excess hydrogen by virtue of the aromatization reaction.

Process Equipment and Flow

Fig. 1 is a simplified flow diagram of a typical Platforming unit for motor-fuel production. The unit may be divided into three sections: a feed-preparation section, a reaction section, and a stabilization section.

The feed-preparation section consists of a fractionation column taking material boiling in the gasoline range and removing overhead any light gasoline that need not be charged to the reaction zone by virtue of its high octane number. A small amount of bottoms is removed to insure that a minimum of extremely high-molecular-weight material will reach the catalyst. The reactor charge is drawn from the column as a sidecut. The type of feed-preparation section used is dependent on the existing facilities and varies to a considerable extent among plants.

The reaction section consists of preheaters for the reactor feed and recycle gas, beds of catalyst, intermediate heaters between catalyst beds, heat exchangers, a product separator drum, and a recycle gas compressor. Catalyst is divided into two or more beds in series depending on the severity of the operation and on the type of feed stock, with interheating between beds of catalyst, as the overall reaction is endothermic. Reactor feed stock from the feed-preparation section is pumped to the naphtha heater for preheating to reaction temperature.

At the inlet to the first catalyst bed, the heated recycle gas joins with the naphtha. These two streams may be heated in the same coil if the plant is not too large. The reactants are reheated between catalyst beds by an intermediate heater or heaters. After heat exchange, the reaction products flow to a separator drum from which the recycle gas compressor takes suction. The net make of gas goes to fuel. Liquid product from the separator drum passes to a stabilizer for preparation of a finished gasoline.

The stabilization section consists of a high-pressure stabilizer for production of a finished gasoline of desired vapor pressure from the bottom of the column. Gas from the stabilizer reflux drum enters the absorption system or fuel system as is desired.

*See The Oil and Gas Journal, March 30 and April 6, 1950.

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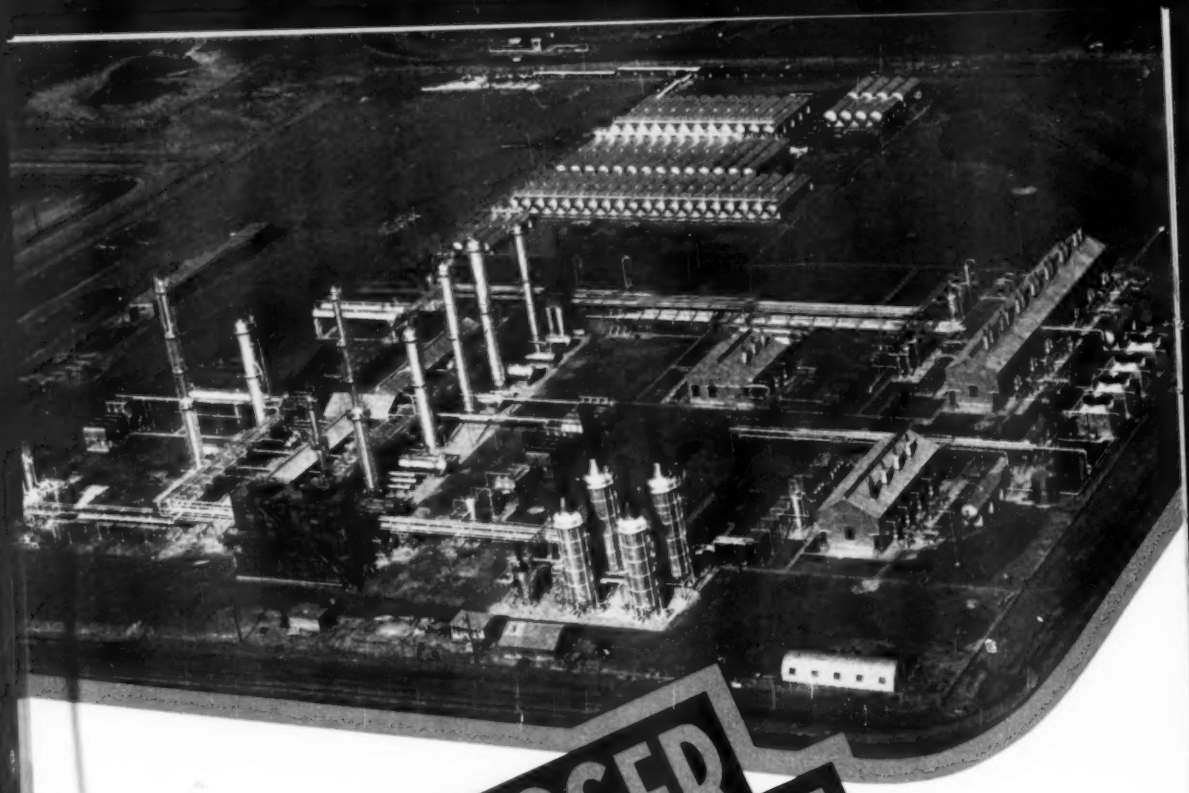

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No rerunning of the stabilizer bottoms is necessary since no high-boiling products are made.

Typical Results from Platforming

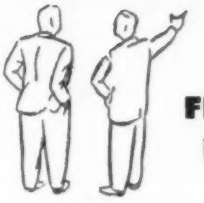
Table 1 lists a number of natural gasolines which have been obtained from a variety of sources. It will be noted that these stocks are not of the same boiling range and are therefore not exactly comparable in the way they respond to Platforming. It may also be noted that the original octane number of the stocks varies to some extent, due mainly to boiling range rather than any other factor. From our analyses of various stocks, it appears that natural gasolines of comparable boiling range do not vary in their chemical components to nearly the extent that has been encountered in straightrun gasolines. It is therefore extremely important that the boiling range of the stock which is to be processed be carefully considered as well as the octane number which must be obtained on the total finished product.

The platformates which have been produced from the stocks listed in Table 1 looks satisfactory and indicate that there is no particular difficulty in reaching a high octane number. It is evident that there is some increase in volatility but the increase is slight enough so that this does not seem to present any particular difficulty. These stocks are the higher-boiling fractions of natural gasoline and, while the exact properties of the material boiling below 200° F. are not available, these are estimated to have leaded research octane number of 90 or higher.

Light-Gasoline Removal

In view of the effect of the boiling range on the final octane number of the product and on the amount of feed stock it is necessary to platform to reach a given octane number, it was felt that an investigation was necessary to determine this effect in more exact terms.

A debutanized product was obtained from a plant in Carthage field which was operating in such a manner that the ratio of condensate to absorbed material was as near that of the field production as is possible to reach. This stock, containing all liquid material heavier than butane, was fractionated to produce various cuts up to approximately 400 F. end point. Table 2 contains inspection data on the subject natural gasoline. By processing the fractions at different severities and blending back the material which was not processed, we determine the curves shown in Fig. 2. These curves show the optimum quantity of light gasoline which can bypass the reaction zone and still obtain the maximum yield at any given octane level. It is evident, however, that at the lower octane levels, these curves are fairly flat. This merely points out that relatively small quan-



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tities of the feed stock need be processed, resulting in lower unit capacities, hence lower capital operating costs.

Table 3 shows some of the product properties and yields when operating to produce finished gasolines of 88, 90, and 92 research octane number with 3 cc. of tetraethyl lead. The proportion bypassing the reactor represents the optimum amount to obtain the maximum yield at each octane level. As stated above, it may not be the optimum point from an economic standpoint, as this will depend on gasoline values, capital, and operating costs. Additional butane requirement is also tabulated.

Operating Costs for Platforming

The cost of Platforming units will, of course, vary depending upon the available facilities. It does appear, however, that the Platforming unit might fit into the usual natural-gasoline recovery plant with a lower capital expenditure because the present recovery and fractionation system of the gasoline plant could handle almost entirely the functions of the prefractionator and stabilizer with little increase in load on the columns. The reaction section then becomes the major item of expense. This must be determined for individual situations.

The following plant costs are for complete units as shown on the flow chart and include all equipment within the process area: $500,000 for a 1,000-bbl. per stream day charge to reactors, $700,000 for a 1,500-bbl. per stream day charge, and $1,600,000 for 5,000-bbl. charge.

Operating costs have been estimated for a 1,500-2,000-bbl. per stream day Platformer as shown in Table 4. The figure for utilities does not include fuel gas, since the Platformer is very nearly self-supporting from the standpoint of fuel-gas requirements for its heaters.

TABLE 4—OPERATING COSTS FOR PLATFORMING 1,500-2,000-BBL. PER STREAM DAY CHARGE

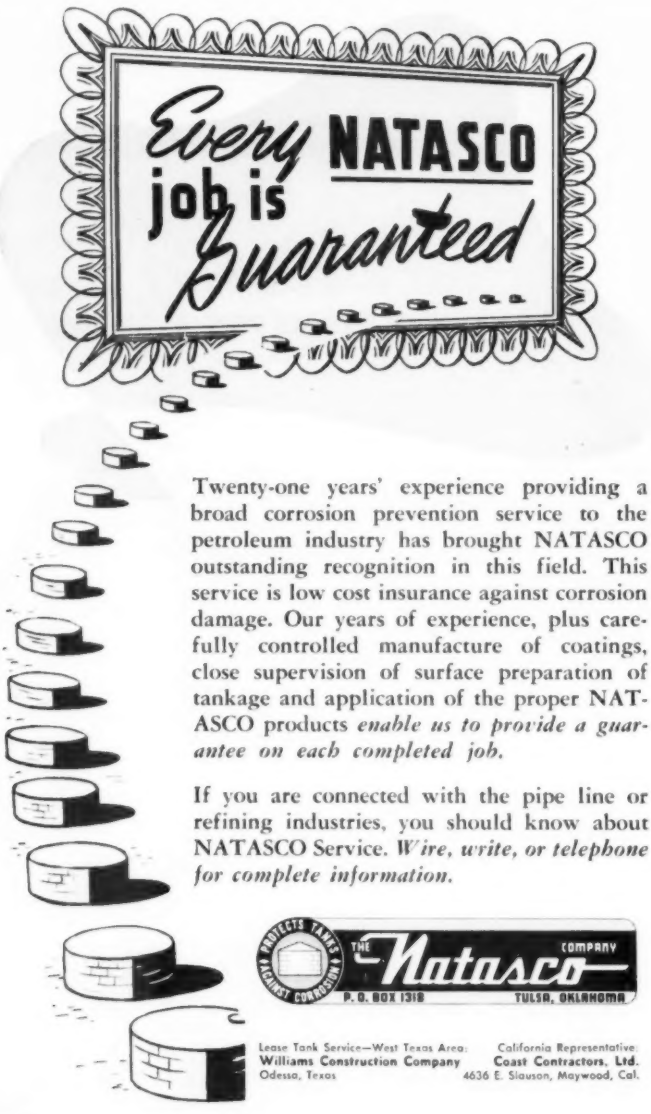
	Cents per bbl. reactor charge
1. Operator and part-time helper per shift	4-5
2. Maintenance	3-5
3. Taxes and insurance	4-5
4. Utilities	4-5
5. Catalyst	Less than 10
6. Royalty (present)	7
Total	30-37

TABLE 5
Road Ratings of Two Platformates by a 1949 Oldsmobile at 10:1 Compression Ratio

°A.P.I. at 60° F.	66.3	68.2
R.v.p.	10.8	10.2
A.S.T.M. D-86 distillation:		
I.b.p., °F.	100	94
5 per cent	117	107
10 per cent	126	115
30 per cent	164	140
50 per cent	200	172
70 per cent	236	215
90 per cent	295	285
95 per cent	324	316
End point	351	343
Per cent bottoms	1.0	0.5
Per cent loss	1.0	1.5
Analysis:		
Paraffins + naphthenes, per cent	79	73
Olefins	0	0
Aromatics	21	27
Octane number ratings:		
Research method (F-1):		
Clear	74.0	80.3
+1.0 ml. TEL/gal.	82.9	88.9
+3.0 ml. TEL/gal.	88.1	93.4
Motor method (F-2):		
Clear	71.5	77.2
+1.0 ml. TEL/gal.	80.4	84.7
+3.0 ml. TEL/gal.	86.0	88.3
F-8B road rating (Olds. 10:1 C.R.):		
+1.0 ml. TEL/gal. at		
800 r.p.m.		<85.0
1,000 r.p.m.		85.5
1,500 r.p.m.		89.5
2,000 r.p.m.		89.5
2,500 r.p.m.		90.0
+3.0 ml. TEL/gal. at		
800 r.p.m.	86.0	88.0
1,000 r.p.m.	88.0	93.5
1,500 r.p.m.	91.5	95.5
2,000 r.p.m.	92.0	96.5
2,500 r.p.m.	92.0	97.5

Properties of Platforming

Road rating.—These data have not been completed on platformates made from natural gasoline. From the hydrocarbon composition of such stocks, it would appear that they will act



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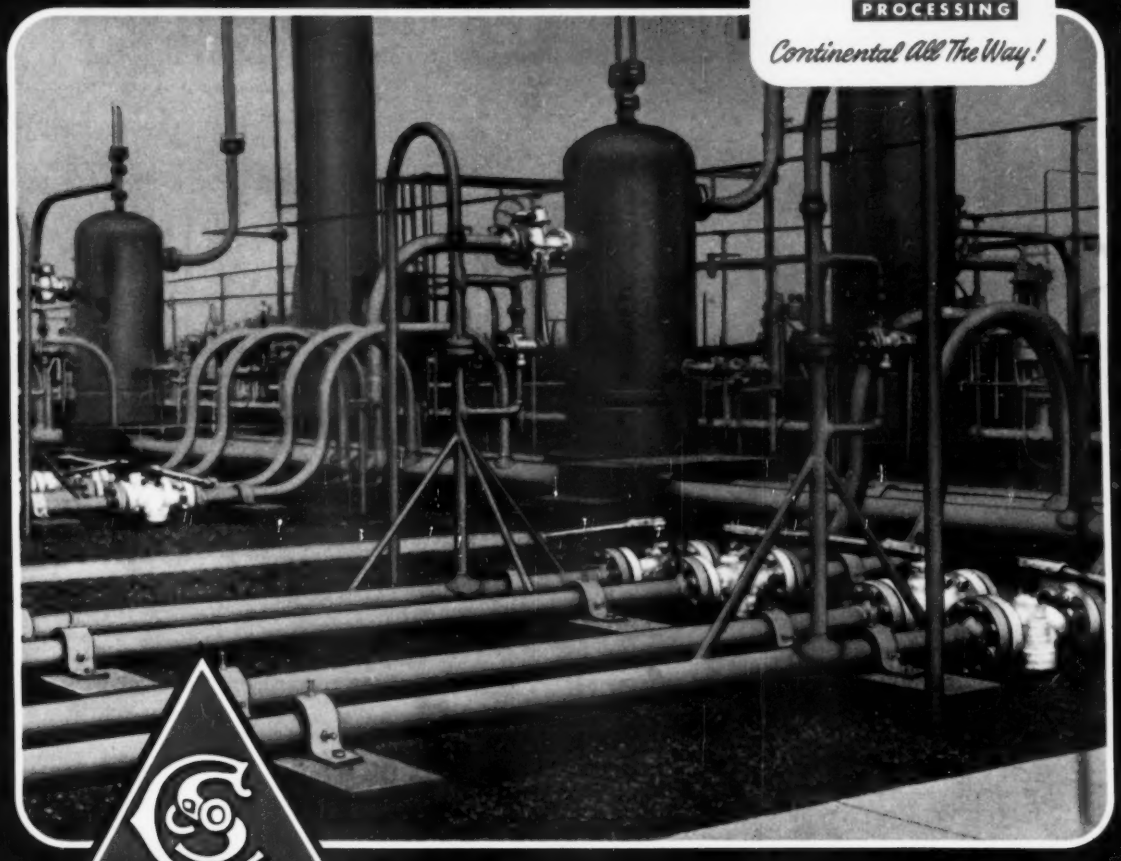

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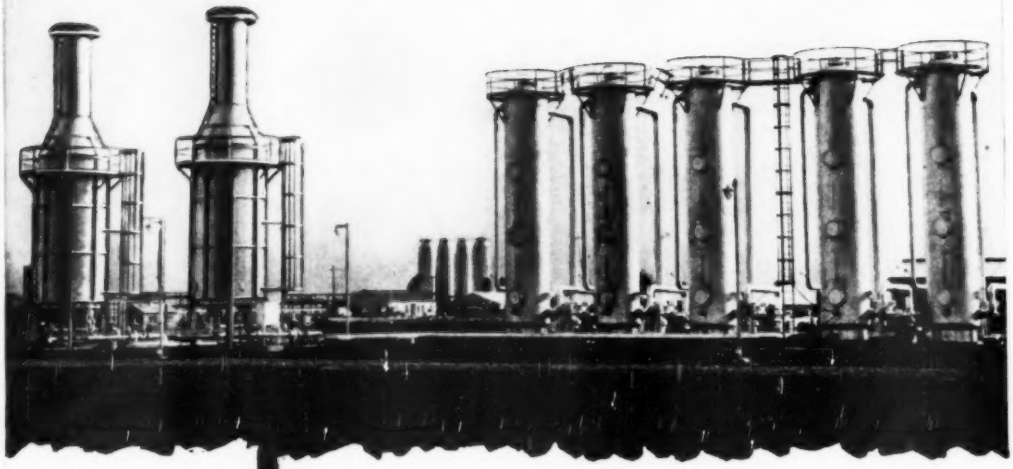

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TABLE 6—STORAGE STABILITY TESTS

	Start	2 mo.	4 mo.	6 mo.	9 mo.
Peroxide No.	0.1	0.98	0.7	0.8	0.7
Induction period, min.	>1,020				
A.S.T.M. gum	0	1	1	1	1
Color, °Saybolt	21	17	15	15	15

in the same manner as platformates produced from straightrun gasolines of comparable boiling range.

Table 5 contains inspection data on two platformates produced in a pilot-plant Platforming unit from a straightrun gasoline having properties similar to the natural gasoline processed. One is a high-octane-number platformate, while the other is intermediate in octane level.

The F-8B road ratings were obtained on these platformates in a 1949 Oldsmobile test car fitted with heads for 10:1 compression ratio. It is important to note that the road ratings of the platformates at the 3.0-ml. TEL level was equal to or better than the research method (F-1) octane number at all engine speeds above 800 r.p.m., while at the 1.0-ml. TEL level, the same was true at all engine speeds above 1,000 r.p.m. A number of other platformates have been tested on the road and all indicate that the road rating is equal to or better than the research method octane number.

Storage stability. — Platformate is stable in storage and requires the addition of inhibitor only for the purpose of retaining tetraethyl lead in solution, as do straightrun gasolines. Storage-stability tests have been made on platformates produced in pilot-plant operation. Given in Table 6 is a summary of storage results on a platformate from Michigan straightrun. These tests were made in vented bottles at 100° F. and no inhibitor was added.

Sulfur content.—Experimental work has indicated that the sulfur removal from different stocks has been from 88 to 99 per cent, with initial sulfur content having little effect on the sulfur remaining in the platformate. The finished total sulfur content Finished total sulfur content varies between 0.002 and 0.005 per cent.

La Gloria Plant Gets Three Major Additions

(Continued from page 183)

avoided when metering. The lines from the scrubber to second-stage suction header are 18-in. pipe and are of sufficient length for a good meter run and operate at 29 psig. The total of these two meters checks very closely with the total of the lease separator battery meters.

When the gas leaves the third-stage discharge scrubbers, it passes to two absorbers operating in parallel at 300 psig. These absorbers are 66-in. i.d. and have 30 trays of new high-efficiency design. Three hundred and sixty-five gallons of lean oil per minute are supplied to each absorber. The residue gas leaving the absorbers goes to a carbon-black plant.

Rich oil from the absorbers moves to top of the larger diameter section of a two-diameter column called a propanizer-reabsorber. In the top of the larger-diameter section, the rich oil flashes, due to the lower pressure of 125 psig., and the vapors pass to the bottom of the smaller-diameter section, which is the reabsorber section. Eighty-five gallons of lean oil per minute are fed to the reabsorber.

After flashing in the top of the larger or propanizer section, the rich oil continues down this column contacting with the vapors from the raw-product tank. During this contact, the propane and heavier fractions, along with considerable ethane, are absorbed by the rich oil, and through this absorption methane is liberated from solution with rich oil.

The bottom of the propanizer is also a rich-oil surge chamber from which the rich-oil pump takes suction. A liquid-level controller, governing a motor valve on the discharge line of the rich-oil pump, controls the level in the surge chamber. The pump forces the oil through the heat exchangers to the hot-oil flash tank.

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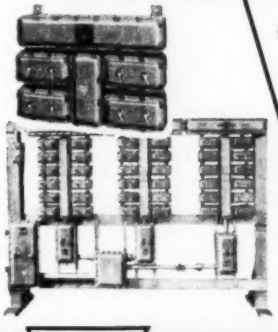

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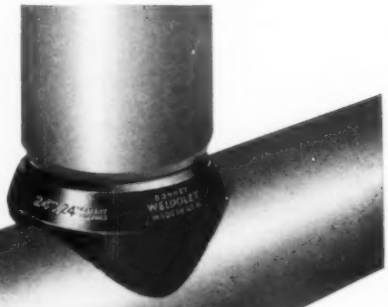

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Note in the above illustration how the WeldOlet tapers to provide a single bevel groove joint at the crotch section and blends into a V-butt joint at the ear portion.

WeldOlets need no additional reinforcement to establish and fully maintain original strength on ASTM A-106 Seamless Steel Grade A Pipe, as set forth in Code for Pressure Piping, American Standards Association, B31.1-1942, and Supp. No. 2, B31.1-b-1947.

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Fig. 1—Cut-away view of reducing size WeldOlet with welding outlet in place. The external rib and wide bases or footings of WeldOlets eliminate the need for extra supports to take care of bending or vibrational stresses at crotch section, the point of greatest stress.

Fig. 2—Note blending of ear portion of welding fitting to run pipe. Extension of weld metal below inside scarfed portion of pipe insures all sections of joint greater than pipe wall thickness.

The oil temperature rises to 540° F. through exchangers.

The hot vapors from the hot-oil flash tank enters the still one tray above the hot rich-oil inlet. These hot vapors have the same effect in the still that stripping steam does; thus the amount of steam required is reduced.

The rich oil passes from the hot flash tank to a direct-fired heater of the horizontal-tube type. Here the temperature is increased to 510° F. From the heater, the oil passes directly to the still.

The still has two dewatering trays near the top where stripping steam condensate is removed. This removal of water reduces the load on the overhead condensers. Another feature of operation that materially reduces the overhead condenser load is the use of cold rich oil as reflux in the still. A small, fixed amount of gasoline reflux is used and the overhead temperature of the still is controlled by varying the rich-oil reflux.

After condensation, the overhead product goes through a raw-product tank where the remaining stripping steam condensate is removed. From the tank, casing-head gasoline as it is now called, is metered by a positive-displacement meter. At this point, a small sample is taken under pressure every day, and at the end of the month an analysis is run on the composite sample to determine the propane, butane, and pentane and heavier content. The meter is checked at least once each month by calibrated proving tanks. From the metered volume and the analysis, production of propane, butane, and pentane from the casing-head plant is calculated before it is mixed with the cycling-plant production in the fractionating-unit feed tank.

Centrifugal pumps are used throughout the plant. Electric motor drive is used in the compressor unit and steam turbines are used to drive the rich and lean-oil pumps.

Lean oil from the heat exchangers is cooled with aerial-type units and final cooling is with shell-and-tube coolers. Intercoolers in the compressor plant also are shell-and-tube type as are the still overhead product condensers.

Steam is supplied by a 750-hp. water-tube boiler equipped with superheater. Electricity is generated with a two-cycle gas engine directly connected to a 480-volt, 3-phase generator. The boiler and generating unit duplicates six boilers and three generating units used in cycling plant.

An induced-draft cooling tower is used to cool the water circulating through the shell-and-tube equipment. Electric-motor drives are used for the fans and water pumps on this cooling tower.

Design and construction of both cycling and casing-head plants were by Hudson Engineering Corp., Houston.

Projects Now Considered Will Increase Input Gas Capacity 100,000,000 Cu. Ft.

by R. B. Tuttle

CLOSE to 100,000,000 cu. ft. of input gas capacity is involved in the new natural-gas-processing projects now under consideration by various operating companies in the United States. More than 30 per cent of the projects under way, authorized and planned, as reported to The Oil and Gas Journal, are in the planned category. Now under consideration or planned are 16 projects involving 6 new plants, a number of plant expansions and new facilities for various types of natural gas field processing operations.

Currently, all projects included in the Journal's second quarter survey of expansion activity in the natural gas processing industry are scheduled for completion in 1950. Those projects now under way include some plants which are scheduled for completion by mid-year; others are set for later dates.

Greatest activity involving new plant construction, in any single area, is in Scurry County, Texas. Here, one large plant is now being erected and three others are expected to be started in the very near future.

NATURAL-GAS PROCESSING-PLANT BUILDING PROJECTS

Company, location and type of project—	Capacity rating	Status	Comp. schedule	Contractors
American Republics Corp., Tyler County, Texas:				
Convert plant from compression to absorption type, gal. per day	10,000	Considering	1950	
Anzac Oil Corp., Coleman County, Texas:				
Gas-injection unit, cu. ft. per day	500,000	Considering	1950	
Arkansas Fuel Oil Co., Ruston, La.:				
Gasoline plant, cu. ft. per day	50,000,000			
Barnsdall Oil Co., Scurry County, Texas:				
Natural-gasoline plant, cu. ft. per day	26,000,000	Considered		
Bolin Trust, Wichita County, Texas:				
Gas-injection unit		Authorized		
California Co., Barataria, La.:				
Natural-gasoline plant, cu. ft. per day	25,000,000	Considering		
Coastal Refineries, Inc., and Mayfair Minerals, Inc., McAllen, Tex.:				
Cycling plant, cu. ft. per day	75,000,000	Building	1950	Gasoline Plant Const. Co.
Columbian Fuel Corp., Hickok, Kans.:				
Desulfurization unit, cu. ft. per day	2,200,000	Building	1950	Graff Engineering & Equipment Co.
Delhi Oil Corp., Barker Dome, N. M.:				
Natural-gas desulfurization unit		Considering		Graff Engineering & Equipment Co.
El Paso Natural Gas Co., Upton County, Texas:				
Natural-gasoline plant, cu. ft. per day	15,000,000	Authorized	Apr. '50	
El Paso Natural Gas Co., Lea County, New Mexico:				
Increase natural-gasoline plant, gal. per day	161,000	Considering	1950	
El Paso Natural Gas Co., Crane County, Texas:				
Gas-treating plant, cu. ft. per day	15,000,000	Building	1950	
El Paso Natural Gas Co., McCamey, Tex.:				
Compressor and purification unit, cu. ft. per day	15,000,000	Authorized	Apr. '50	
Fullerton Oil Co., Scurry County, Texas:				
New gasoline plant, cu. ft. per day	40,000,000	Building	July '50	Hudson Engineering Co.
Gulf Oil Corp., Crane County, Texas:				
Natural-gasoline plant, cu. ft. per day	40,000,000	Building		C. F. Braun & Co.
Hanna Petroleums, Ltd., Hanna, Alta., Canada:				
Natural-gasoline plant, cu. ft. per day	1,000,000	Planned	1950	
Haynesville Operators Committee, Haynesville, La.:				
Expand compressor station, hp.	800	Building	1950	
Imperial Oil, Ltd., Leduc, Alta., Canada:				
Gas conservation, cu. ft. per day	24,000,000	Building	1950	
Kirk Pool Operators Committee, Eastland County, Texas:				
Natural-gasoline plant		Planned		
La Gloria Corp., Jim Wells County, Texas:				
Expand natural-gasoline plant, cu. ft. per day	10,000,000	Planned	1950	
Lion Oil Co., Scurry County, Texas:				
New natural-gasoline plant		Planned	1950	
Lone Star Gas Co., Eastland County, Texas:				
Increase plant capacity, gal. per day	15,000	Considering		
Lone Star Gas Co., Royston, Tex.:				
Desulfurization-dehydration unit, cu. ft. per day	10,000,000	Building		O. L. Olsen
Lone Star Gas Co., Palo Pinto County, Texas:				
Hypersorption plant		Authorized		Foster Wheeler
Magnolia Petroleum Co., Karnes City, Tex.:				
Natural-gas condensate-processing plant, cu. ft. per day	10,000,000	Building	1950	Delta Engineering Co.
Magnolia Petroleum Co., Grady County, Oklahoma:				
Pressure maintenance and cycling, cu. ft. per day	25,000,000	Building	1950	Delta Engineering Construction Service Co.
Magnolia Petroleum Co., Grant County, Kansas:				
Natural-gasoline plant, cu. ft. per day	100,000,000	Building		Walco Engineering Const. Co.
McKamie Gas Cleaning Co., McKamie, Ark.:				
Distillate and gasoline, increase, gal. per day	200,000	Authorized	1950	

Company, location and type of project—	Capacity rating	Status	Comp. schedule	Contractors
Paloma Operators Unit, Bakersfield, Calif.:				
Absorption plant, cu. ft. per day	60,000,000	Building	June '50	C. F. Braun & Co.
Phillips Petroleum Co., Edmond, Okla.:				
Increase gasoline plant, cu. ft. per day	60,000,000	Building	Apr. '50	Refinery Maintenance Co.
Pure Oil Co., Andrews County, Texas:				
Natural-gasoline plant, cu. ft. per day	25,000,000	Building	July '50	Hudson Engineering Co.
Pure Oil Co., Worland, Wyo.:				
Crude stabilization and L.P.G., cu. ft. per day	20,000,000	Building	Apr. '50	
Richfield Oil Corp., Santa Barbara County, California:				
New natural-gasoline plant, gal. per day	139,000		1950	
Shell Oil Co., Kern County, California:				
Gasoline plant				
Shell Oil Co., Washita County, Oklahoma:				
New natural-gasoline plant, cu. ft. per day	100,000,000	Planned	1950	
Shell Oil Co., Lavaca County, Texas:				
Distillate and gas-processing plant, cu. ft. per day	60,000,000	Building	Mid '50	Fluor Corp.
Skelly Oil Co., Carson County, Texas:				
Remodel natural-gasoline plant		Planned	1950	
Skelly Oil Co., Lea County, New Mexico:				
Enlarging natural-gasoline plant, gal. per day	130,000	Building	1950	
Southern Minerals Corp., Nueces County, Texas:				
Absorption and pressure-maintenance unit, cu. ft. per day	56,000,000	Building	Early '50	Process Engineers, Inc.
Standard Oil Co. of Texas, Scurry County, Texas:				
New natural-gasoline plant, gal. per day	102,000	Planned	1950	
Stanolind Oil & Gas Co., Andrews County, Texas:				
Gasoline plant, cu. ft. per day	38,000,000	Building	1950	Jones & Laughlin Supply Co.
Stanolind Oil & Gas Co., North Cowden field, Ector County, Texas:				
Gasoline plant, cu. ft. per day	50,000,000	Building	June '50	Stearns-Roger Mfg. Co.
Sun Oil Co., Egan, La.:				
Natural-gasoline plant		Authorized		
Superior Oil Co., Colorado County, Texas:				
Injection unit		Authorized		
Taylor Refining Co., McAllen, Tex.:				
Cycling plant, cu. ft. per day	75,000,000	Building	Early '50	Gasoline Plant Const. Corp.
Texas Co., Archer City, Tex.:				
Natural-gasoline plant, cu. ft. per day	35,000,000	Building	Early '50	O. L. Olsen
Texas Pacific Coal & Oil Corp., Goldsmith field, Texas:				
Gas desulfurization unit		Building	Early '50	
Union Oil Co. of California, Brea Olinda field, California:				
Increase absorption facilities, cu. ft. per day	6,000,000	Considering		
Union Oil Co. of California, Montebello field, California:				
Crude-oil stabilizer and gas-absorption plant, cu. ft. per day	1,000,000	Considering		
United Gas Pipe Line Co., Karnes County, Texas:				
Natural-gasoline plant, cu. ft. per day	10,000,000	Building	Early '50	Delta Engineering Co.

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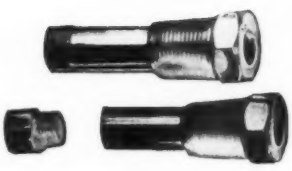

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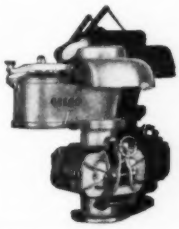

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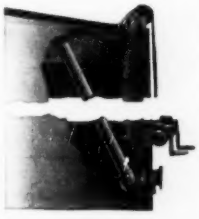

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. . . Some examples of in-fill drilling

by H. H. Kaveler*

NO oil pool can be produced a second or a third time. A pool drilled, developed, and depleted with one well to each 10 surface acres cannot be restored to its native state and produced again to determine if one well to each 20 acres or some other spacing would result in ultimately the same, or more, or less, oil recovery for the pool. The industry is denied the opportunity of repeating the production operation to have directly comparative experience as a means of learning whether the ultimate recovery from a pool is in any way dependent solely on the number of wells drilled. The ordinary procedure of experimental science cannot be followed. For that reason, an indirect deduction from known fact and logical premises must be relied upon in appraising the problem.

Nevertheless, it is a matter of great importance to the nation, to the petroleum industry, and to every owner of rights in an oil pool to know if there is a greater or less recovery of petroleum from any pool depending upon whether a greater or a less number of wells are drilled. Do "more wells produce more oil?" Are "oil reserves lost" because only one well is often drilled to each 40 acres rather than two or four wells to the 40 acres?

These particular questions have been before the industry a long time and have been answered by competent petroleum engineers in a number of excellent publications over the past 15 years.[1] The engineering conclusion is that other elements in the exploitation of any pool are determinative of the ultimate oil recovery; the number of wells drilled is not.

In spite of the long-established engineering conclusion, persistent efforts are continued by some who seek to propagate the myth that "more wells produce more oil." They are the advocates of "close" well spacing. Those who would like to believe the myth of close spacing of wells, or who would like for others to believe it, are driven to the defensive cry that the logic of petroleum engineering fact is too theoretical for the (self-styled) "practical" man, and that the conclusions drawn from technology are not confirmed by experience.

What, then, is experience? Those who advocate the drilling of many wells have never published comprehensive field histories pointing to specific examples where, in the operation of actual pools, the recovery of oil from a pool was greater because a greater number of wells were drilled. Heroic addresses on the "expert" witness stand is the usual forum for expounding generalized conclusions, alleged experiences, and purported scientific fact by those who advocate dense drilling as the necessary and essential step to the recovery operation. If experience is to be the ultimate test of fact, then, if there be fact, the advocates of close well spacing should utilize opportunities to lay the full fact of experience before the industry. What does the history of oil pools reveal?

Purpose of this paper.—This report will present production statistics and related facts concerning six pools as typical examples of among more than 50 pools that have come to notice and study. In each instance, the number of wells in the pool have been increased by either in-fill drilling or extension drilling. These are examples of pools that have been developed since production statistics and subsurface information records have been kept with sufficient accuracy and detail to permit conclusions respecting the relationship between ultimate recovery and number of wells drilled in a pool. The distinction between "pool" and "field" is important to logical conclusion. A pool is considered to be a single common source of supply. A field may consist of one or more pools.

If others will attempt further analysis and refinement of the data to be presented, or undertake to search the records to establish other examples, the effort in preparing this paper will be considered worth while. If experience is to be the final count, then an effort to throw the mythical experience of the advocates of close well spacing into true light can be an important contribution to the advancement of the conservation practices of the industry.

Fundamental Production Fact

Wells do not produce oil! Wells only provide the means for utilizing the energy of production by creating pressure "sinks" to drain reservoir energy and to establish the process that brings about the expulsion of oil from rock. Wells also provide the means whereby the oil expelled from rock can be lifted to the surface of the earth. The fundamental fact is that oil is produced only by the "drive" of expanding gas or water from within the reservoir rock to the well or wells drilled into the rock. When reservoir pressure is exhausted—reservoir energy is exhausted—and with centainty—petroleum production is exhausted. Only that number of wells are required in a pool that will utilize the energy of production beneficially. Any number of wells in excess of that minimum number are wasteful wells.

Ultimate recovery of petroleum is not substantially dependent upon the total number of wells drilled. Reservoir pressure maintenance is the only means for increasing ultimate recovery and dense drilling or an increase in number of wells is in no manner an effective substitute for pressure maintenance.

How many wells are required in a pool?—While a general discussion of well spacing is not the primary purpose of this paper, it may be useful, for discussion of the field data to be presented, to restate the principles established by petroleum engineering technology in respect to the number of wells that should be drilled into any pool. That number of wells should be drilled into any **common source of supply** that are necessary to:

1. Define the extent of the pool and the limits of production.

2. Insure that every segment of the pool productive of petroleum is penetrated by at least one well.

3. Insure sufficient wells, after con-

*Assistant to vice president, production department, Phillips Petroleum Co., Bartlesville, Okla. Paper presented at spring meeting, Mid-Continent district, American Petroleum Institute, Division of Production, Oklahoma City, March 29-31, 1950.

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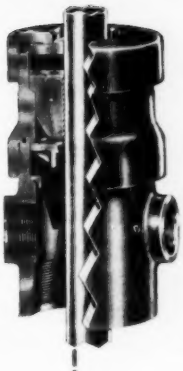

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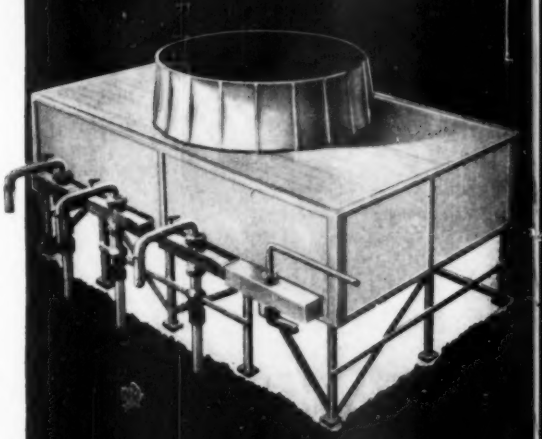

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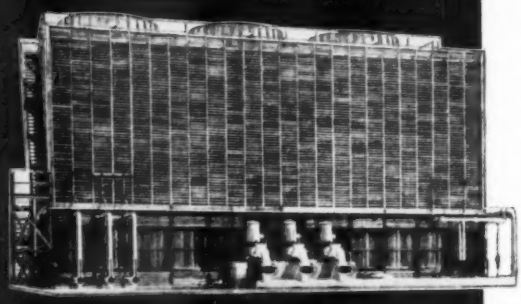

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sideration to geological and reservoir characteristics of each pool, to permit the maximum beneficial use of either natural or artificial sources of reservoir energy.

4. Insure sufficient numbers of wells to maintain productive capacity at rates equal to, or, in excess of market demand for petroleum.

These principles, based on sound technical fact, obviously do not fix the well spacing at one well per 10 acres nor at any other density. They do stand against the notion that the number of wells alone determines the ultimate recovery from a pool. The extent to which they are adopted depends upon the many circumstances arising from regulatory practices and policies existing in the various states that are taken into consideration in reducing any technical principle to practice.

Aspects of "Close Spacing" Myth

The notion that "more wells produce more oil" has wide appeal to laymen. Many so-called "experts" are always willing to tell a client what the client likes to hear. The average layman falls victim to the close-spacing myth often as a result of one or more of the following misconceptions:

1. That wells on separate tracts are the only means for an owner of a separate tract to share in the production from a common source of supply.

2. That the mere drilling of a well or wells on a separate tract will insure the owner of his "fair" share from a common source of supply.

3. That the drilling of equidistant offsets or equal density of wells is an act which in itself will protect a tract against drainage.

4. That the more wells drilled the greater the recovery from a pool.

In respect to these misconceptions, the following statements, briefly made, apply:

The beneficial use of reservoir energy is the determining factor in establishing recovery from a pool. Any well drilled into a pool drains oil not alone from beneath the separate lease on which it is drilled, but from the entire pool. The production that comes to any well or lease may or may not be a surface owner's fair share of the production from the entire pool. The amount of production from any separate lease is determined in large part by the allocation formula if the pool is prorated, and in large part by the conduct of offsetting and competing owners in their recognition of the correlative rights of others. A compelling reason for drilling unnecessary wells exists whenever a system of proration allocates oil to wells on a "per well" basis. The separate lease most densely drilled recovers ultimately the greater share from a common source of supply. The only means for maximizing the recovery from a pool, and for obtaining a fair distribution of the pool production to each separate owner is through the established system of unit operation.

The close-spacing myth is the folklore of those in possession of incomplete, unrecorded, and unwritten history of pools. In the absence of recorded fact, experience becomes legendary and occurrences are recalled from the vague and hazy past, involving instances where an additional well produced an astonishing amount of oil that would not otherwise have been recovered. Such legend is poor evidence in resolving the question of well spacing.

In the course of the studies presented in this paper, attention was frequently directed to the reported "initial potentials" of in-fill or extension wells drilled in old pools. Many in-fill drilled wells, which by "recollection of the expert," had a potential of 1,000 bbl. per day, actually had, upon investigation of its production record, no higher monthly production than the average of offsetting and older wells, even in the first month of production. Or, investigation when records were sufficient to permit an investigation, showed that the astonishing well was completed in a reservoir or separate pool theretofore undrilled.

Conclusions supported by field data to follow.—The history of fields drilled and produced at various densities of wells where records have been kept with sufficient accuracy to permit analysis establishes of following general conclusions:

1. A well has the capacity to drain an area of a common source of supply much larger than the area attributed to its drilling or spacing unit.

2. The capacity to drain a large area of a common source of supply occurs in limestone reservoirs as well as in sandstone reservoirs.

3. Increased numbers of wells may often cause a decrease in ultimate recovery of oil if increased numbers of wells result in excessive depletion of reservoir energy by drilling into gas-caps or high gas-oil ratio areas of a pool, or, by drilling into the water table with resultant excessive production of water in a water-drive pool.

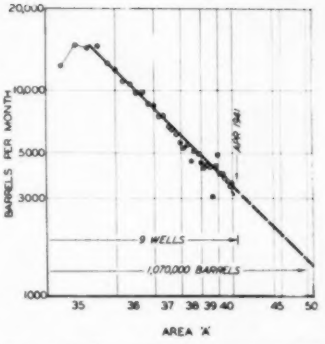

Fig. 2—Decline curve for 40-acre spacing.

4. For the greatest ultimate oil recovery, sufficient wells must be drilled to penetrate every productive segment of a pool, and the distribution of wells should be such as to define the pool, and, to utilize the energy of production with maximum benefit.

5. Cutler's rule expresses an empirical relationship for determining the amount of oil that may be captured or drained from the entire common source of supply by separate leases drilled to different well densities.

Hotulke-West Earlsboro

The Hotulke-West Earlsboro Hunton limestone pool is located in Township 9n, Range 4e and 5e, Pottawatomie County, Oklahoma. The Hunton limestone production occurs at a depth of 4,100 ft. and has from 50 to 60 ft. of gross thickness according to electric logs taken in the most recently drilled wells.

The discovery well was completed in 1930 and is marked as well No. 1 on Fig. 1, which figure also shows by dashed line the ultimate area of the pool and by a hachured line an area "A" whose production history is to be compared before and after complete development. Nine wells were drilled on 40-acre spacing by the year 1935. These nine (original) wells had a production history to the end of the year 1940 reflected by the decline curve on Fig. 2. Extrapolation of this decline curve indicates that

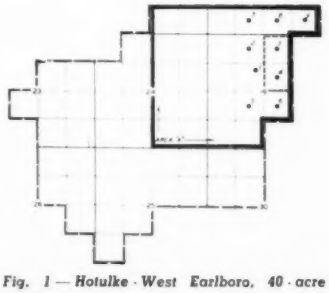

Fig. 1 — Hotulke - West Earlboro, 40 - acre spacing.

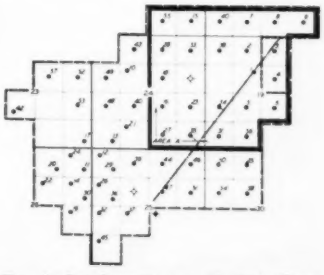

Fig. 3—Development into 20 and 10-acre spacing.

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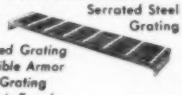

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the recovery to the year 1950 would have been 1,070,000 bbl. The nine wells were first classified as the West Earlsboro pool.

In May 1940, well No. 10 was drilled approximately 1¼ miles to the west and well No. 11 was drilled approximately 2 miles to the west of the nine wells to develop what later proved to be a southwest extension of the pool (Fig. 3). In the area of well No. 11, there followed the drilling of 16 wells on 20-acre spacing, which development was classified as Hotulke—20 - acre spacing. The remainder of the area around well No. 10 was classified as Hotulke—40-acre spacing. The production history of the pool is difficult to follow because of these separate pool designations. Ultimately, all of the production was found to be from one common source of supply, fully developed as shown by Fig. 3.

To the north of the area is other Hunton limestone production. The tier of quarter-quarter sections lying to the north of the Hotulke-West Earlsboro Hunton limestone was never drilled. An absence of any effective communication between the two areas is indicated. A few wells produced from the Viola and Wilcox formations and a small adjustment to obtain actual production from the Hunton was necessary.

The dry hole to the southeast of the center of Section 25 was drilled and completed in August 1949 for 7 bbl. per day and abandoned after 1 month's production. In January 1950 a well was drilled ¼ mile west of well No. 42 in NW SW SW Section 23. Although this well extended the productive limits beyond that shown by the dashed line, its low initial production of 35 bbl. per day indicates that it will not produce enough oil to affect the conclusions here drawn.

This pool is an example of extension drilling. Attention might be first directed to the original nine wells and their production history in conjunction with the production of the area marked "A." Area "A" comprises 1,000 acres and was fully developed on 40-acre spacing in 1941-1942 with 14 additional wells, a result of the drilling of extension well No. 10. Area "A" with 23 wells produced to the year 1950 only 1,145,000 bbl. as shown by actual production statistics, Fig. 4. This recovery compares with an estimated recovery of 1,070,000 bbl. for the original nine wells to the same date, had no additional development occurred. Four of the six unplugged wells which remain in area "A" are near an economic limit, whereas the nine wells alone would have had at this time a substantial future recovery.

The drilling of the 14 additional wells produced no substantial amount of additional oil to the credit of Area "A." More wells did not produce more oil.

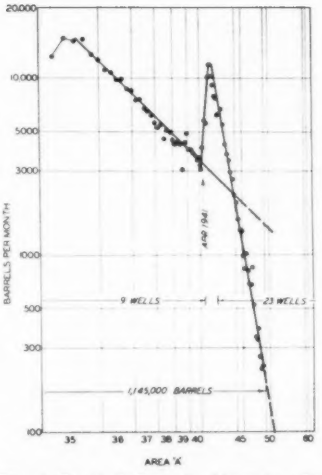

Fig. 4—Rapid decline of additional wells.

Obviously, too, the original nine wells were draining an area larger even than area "A." The 14 wells gave the usual peak in production followed by the usual accelerated decline. Advocates of close well spacing would give considerable attention to the temporarily increased rate of production but little attention to the accelerated decline that inevitably followed. The important fact here, however, is that the comparison of recovery is made in respect to the year January 1, 1950. The deed is done, and area "A" has in hand substantially no more oil than was recoverable through the original nine wells, had no further development taken place throughout the pool.

The decline curve for the entire pool, Fig. 5, leads to the interesting observation that the 58 wells drilled in the pool had recovered as of January 1, 1950, a total of 2,382,000 bbl. Only 12 wells remain as producers. Wells Nos. 32 and 37 have had an

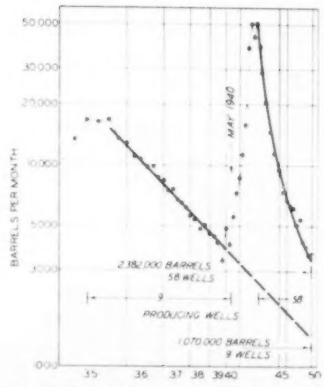

Fig. 5—Total of 58 wells will recover only 2,382,000 bbl.

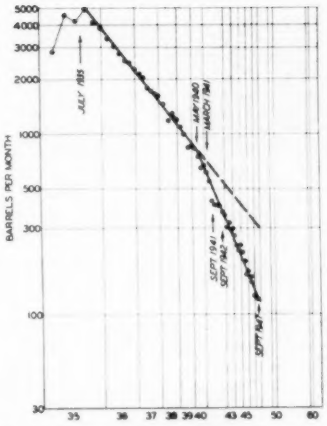

Fig. 6—Curve showing interference by additional wells.

exceptional life in that together they still produce 100 bbl. per day. The decline curve of the original nine wells indicates, without much room for dispute, a recovery to January 1, 1950, of 1,070,000 bbl., a recovery of almost 50 per cent as much for nine wells **clustered at one extremity** of the pool, of that obtained by 58 wells.

This example illustrates the necessity for defining and drilling the entire common oil supply, and it illustrates that wells are capable of draining from a large portion of any common supply. Had the nine wells been drilled over the entire pool rather than at one extremity, they would have recovered as of January 1, 1950, substantially more than 50 per cent of the recovery of the 58 wells.

A cross-section has been constructed which establishes the general characteristics of the pool and emphasizes the fact that this is a limestone reservoir of ordinary limestone characteristics. While some might admit the sufficiency of wide spacing in sandstone reservoirs, there has always been a reluctance to accept wide spacing in limestone reservoirs. Here the technical conclusions in respect to wide spacing fit the performance of a typical limestone reservoir as well as they do sandstone reservoirs.

Example of Well Interference, Limestone Reservoir

The capacity of wells to drain large areas of a pool is no better established than by demonstration of the interference as between wells in a common source of supply. For this purpose, the production history of the two wells, Nos. 3 and 4, in the Hotulke pool can be used.

The production of the two wells is shown on Fig. 6 with a peak of 80 bbl. per day per well and following for 5 years a normal decline.

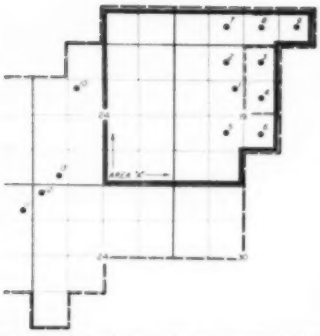

Fig. 7—Map shows extension wells which caused interference.

In the months after the completion of well No. 10, drilled as a 1¼-mile extension of the producing area in May 1940, a point of accelerated decline is indicated. By March 1941, when well No. 13 had been completed, Fig. 7, interference with wells Nos. 3 and 4 was quite evident, even though these wells were more distant than 1¼ miles. In the month of March 1941, well No. 10 was producing at an average rate of 2,500 bbl. per month and the total production from wells Nos. 10, 11, 12, and 13 was at the rate of 8,400 bbl. per month. At the same time, the original nine wells were producing at the rate of 3,100 bbl. per month.

The pool was defined by the 58 wells in September 1942, at which

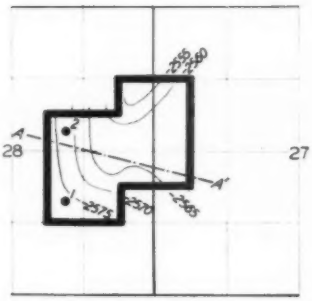

Fig. 8—40-acre spacing, Southeast Warwick pool.

time wells No. 3 and 4 had an established accelerated decline on the log-log scale of Fig. 6, which decline continued to the abandonment of wells Nos. 3 and 4 in September 1947. There is little reason to doubt the conclusion that wells Nos. 3 and 4 absent additional drilling beyond the original nine wells would have drained substantially more oil from distant parts of the reservoir.

Southeast Warwick Cleveland Sandstone Pool

Southeast Warwick Cleveland sandstone pool is located in Township 14n. Range 3e, Lincoln County, Oklahoma, where the Cleveland sandstone occurs at a depth of approximately 3,500 ft. and has approximately 30 ft. of thickness.

The discovery well in this pool was completed in October 1944 with an initial production by natural flow of 138 bbl. per day and is marked well No. 1 in Fig. 8. Hachured lines indicate the area ultimately developed by drilling. Well No. 2 was drilled as a 40-acre offset in December 1944 for an initial potential of 94 bbl. per day. There was no further development for the following 1½ years. The 2-year production history of the two wells is shown on Fig. 9 which curve extrapolated to a production of 300 bbl. per month or to approximately the year 1966 indicated an ultimate recovery of 288,000 bbl.

The next well drilled in the pool

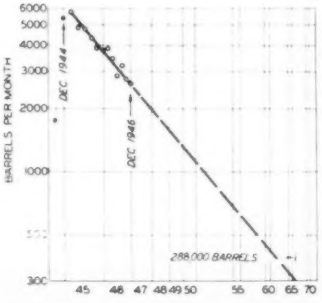

Fig. 9—Decline curve, 40-acre well spacing.

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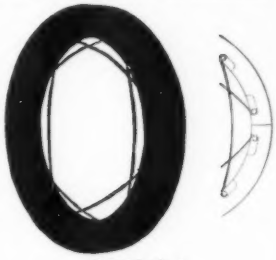

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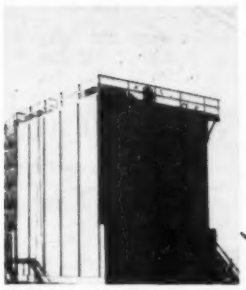

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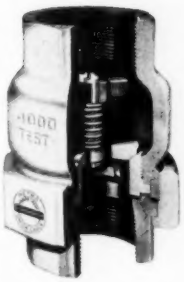

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was a gas well completed in May 1946 with an initial potential of 1,260,000 cu. ft. per day. It was located some 2,000 ft. distant from the discovery well and is marked well No. 3 on Fig. 10. There followed then the drilling of well No. 4 as a north offset to well No. 3, completed as a gas well in October 1946 with a capacity of 8 million cubic feet per day.

Thereafter, wells Nos. 5, 6, 7, 8, and 9 were drilled on 10-acre locations intervening between the initial two oil wells and the two gas wells. The characteristics of these wells and their initial production were as follows:

Well No.	Oil, bbl. per day	Gas-oil ratios, cu. ft. per bbl.	Oil gravity A.P.I.
2	94	(?)	54
6	38	(?)	
8	25	60,000	54
9	10	50,000	
1	138	(?)	42
5	154	13,000	32.5
7	40	76,000	57

The drilling established that a gas-oil contact existed at approximately —2,570 ft. The gas from the two gas wells was marketed for a time and records indicate that a volume of only 421 million cubic feet was sold. No records are available of the gas

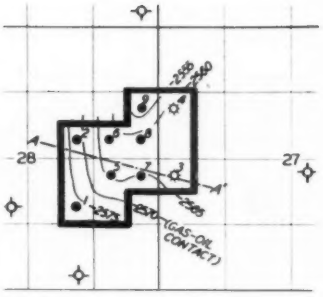

Fig. 10—Southeast Warwick, additional 10-acre wells.

produced from the wells classified as oil wells, although it is obvious from their initial gas-oil ratios that they produced substantial volumes of gas.

The production curve for the pool after complete development is shown in Fig. 11. With additional drilling after December 1946, the pool exhibited the usual increase in production rate followed by an accelerated decline, which was unquestionably due to the production of gas not alone from the two gas wells in the gas cap, but also from the high-gas-oil-ratio wells drilled at or above the gas-oil contact of the pool. The ultimate recovery from the pool as shown by the production history almost to the point of abandonment is only 172,000 bbl., substantially less than normally would have been expected from the original two wells. Only four wells are unplugged at this time. More wells did not produce more oil because the additional wells resulted in wasteful use of gas-cap energy.

Milfay Wilcox Sandstone Pool

Milfay Wilcox sandstone pool is situated in Township 15n, Range 17e, Creek County, Oklahoma. The Wilcox sandstone, found at a depth of 3,900 ft. on an anticlinal structure, has a maximum thickness of 94 ft. above a water-oil contact. The pool is gas drive in type.

The discovery well, marked No. 1 in Fig. 12, was drilled in December 1941. The dashed line shows the ultimate area of development and the hachured line shows the area of ini-

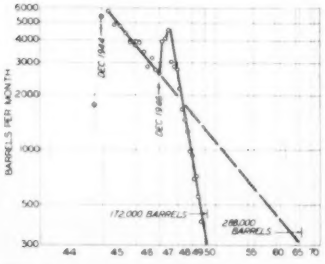

Fig. 11—Rapid decline after 10-acre well spacing.

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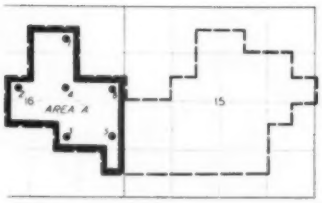

Fig. 12—40-acre spacing, Milfay-Wilcox pool.

tial development, marked area "A." The discovery well was located near the northwestern productive limit of the pool and was completed for an initial production of 130 bbl. per day. Well No. 2 was drilled as a diagonal 40-acre offset and had initial production of 100 bbl. per day. A 2-year lapse in drilling occurred, but by July 1946 a total of six wells had been completed on 40-acre spacing within the original development area "A." The production history on area "A" is shown in Fig. 13 up to the end of 1946.

In December 1946 the pool was extended by the drilling of a well marked No. 7 on Fig. 14 and there followed the development of the entire pool with 43 wells on 10-acre spacing. The wells were drilled in the order numbered in Fig. 14.

The map in Fig. 15 represents contours on the top of the Wilcox sandstone. A cross-section shows the original oil-water contact and points out that the area "A" first developed

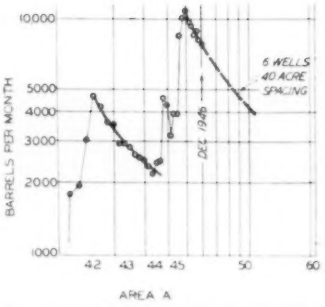

Fig. 13—Decline curves for 40-acre wells.

was in the thinner section where the saturated thickness represented only 22 per cent of the productive sand volume.

In Fig. 16 the production history of area "A" is continued to show the result of in-fill drilling seven additional wells to bring the well density to 10 acres per well. The 13 wells in area "A" had an accumulated production of 569,000 bbl. at the end of 1949. The decline curve on the original six wells indicated the same volume of total production within a year to a year and a half longer time, at which time the original six wells would have been producing 4,000 bbl. per month as compared to the present production of 2,000 bbl. per month from 13 wells. More wells did not mean more oil. The production history of the six wells shows that they were draining an area of the pool substantially larger than area "A."

Well Interference, Sandstone Reservoir

The ability of wells to drain from a large part of the common source of supply is readily illustrated by the production curves of the first two wells drilled in Milfay pool, Figs. 17 and 18. The production from the wells, during the approximate 2½ years they were the only wells in the pool, gradually changed from a declining rate to one that was more or less sustained because of the drainage to these wells from the expansion of the oil and gas in the large untapped portion of the pool. They lost a part of that large oil

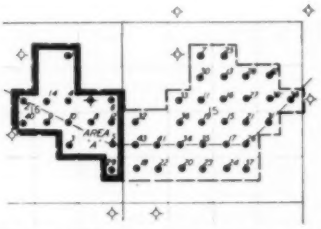

Fig. 14—Milfay, finally developed on 10-acre spacing.

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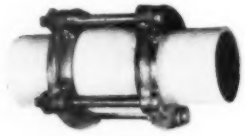

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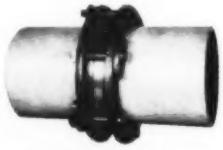

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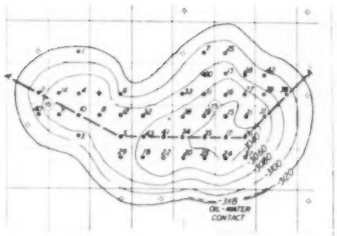

Fig. 15—Wilcox-sand structure map, Milfay.

drainage to wells Nos. 3, 4, 5, and 6 when they were drilled in area "A" to complete the 40-acre spacing pattern.

The loss is shown in the accelerated rate of decline in the production curves from midyear 1945 to the end of 1946. In the period following 1946 when the entire pool was developed on 10-acre spacing, these two wells lost further drainage and showed a still greater rate of decline and are almost at an economic limit of production.

West Agra Cleveland Sandstone pool

West Agra Cleveland sandstone pool is located in Township 17n, Range 3e and 4e, Lincoln County, Oklahoma, at a depth of 3,100 ft., and has a maximum productive thickness of 8 ft. Cleveland sandstone. The structure is a monocline dipping 60 ft. from the discovery well to the southwest edge well. The productive limits of the pool are established by the absence of permeability.

The discovery well was completed in June 1927 for an initial production of 125 bbl. per day. No other wells were drilled in the pool for a period of 15 years by which time the discovery well had declined to a production of 17 bbl. per day. The production history of the discovery well is shown on Fig. 19.

In December 1942 a 10-acre offset well was drilled and completed

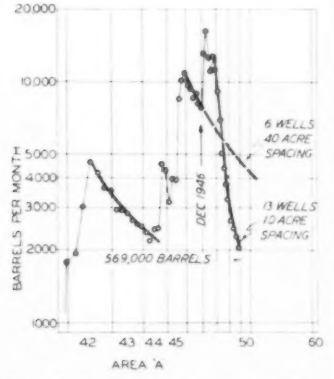

Fig. 16—Steep decline curve for 10-acre wells.

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pumping 60 bbl. per day, and thereafter well No. 3 was completed in January 1944, and three more wells between April 1948 and January 1949. The developed area of the pool is shown in Fig. 20 with the wells numbered in order of drilling.

In Fig. 21 the production history of well No. 1 subsequent to September 1942 demonstrates the effect of additional development on the production from the discovery well. Interference was established by the drilling of well No. 2 in December 1942, before well No. 3 was completed in September 1943, at which time the production from the discovery well had already dropped to 200 bbl. per month. Well No. 1 was plugged and abandoned in 1949.

Wewoka Lake Booch Sandstone Pool

Wewoka Lake Booch sandstone pool is located in Township 8n, Range 7e, Seminole County, Oklahoma, at a depth of 3,200 ft. with an average thickness of Booch sand of 26 ft.

Analysis of the history of drilling in this pool must take into account the fact that the south edge of a larger common source of supply was drilled and produced for a long period before the presence of the larger productive area was established. On the map in Fig. 22 there are indicated 12 wells on or about the section line between Sections 14 and 13, Township 8n, Range 7e, which wells comprise the Jackson pool, first drilled in the year 1926.

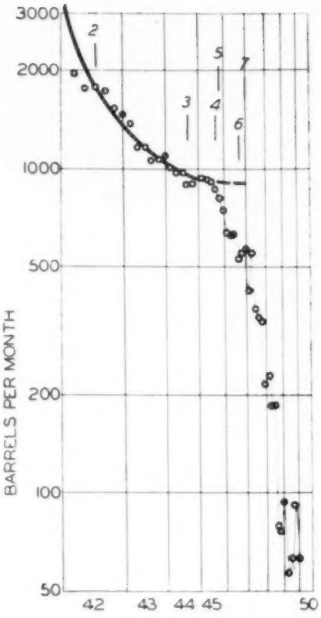

Fig. 17—Curve of first Millay well, showing interference effect from later wells.

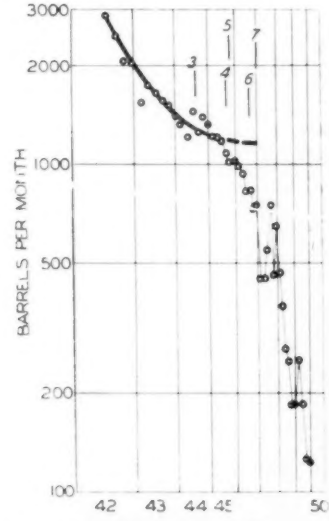

Fig. 18—Production from second Millay well, showing interference caused by additional drilling.

To the north lies an area discovered by the drilling of a well in the SW SW NE Section 2-8n-7e, which was regarded a discovery well of a pool named Wewoka Lake Booch sandstone. This well, marked No. 1, in Fig. 22, was drilled and completed in December 1943 for an initial pro-

(Continued on page 239)

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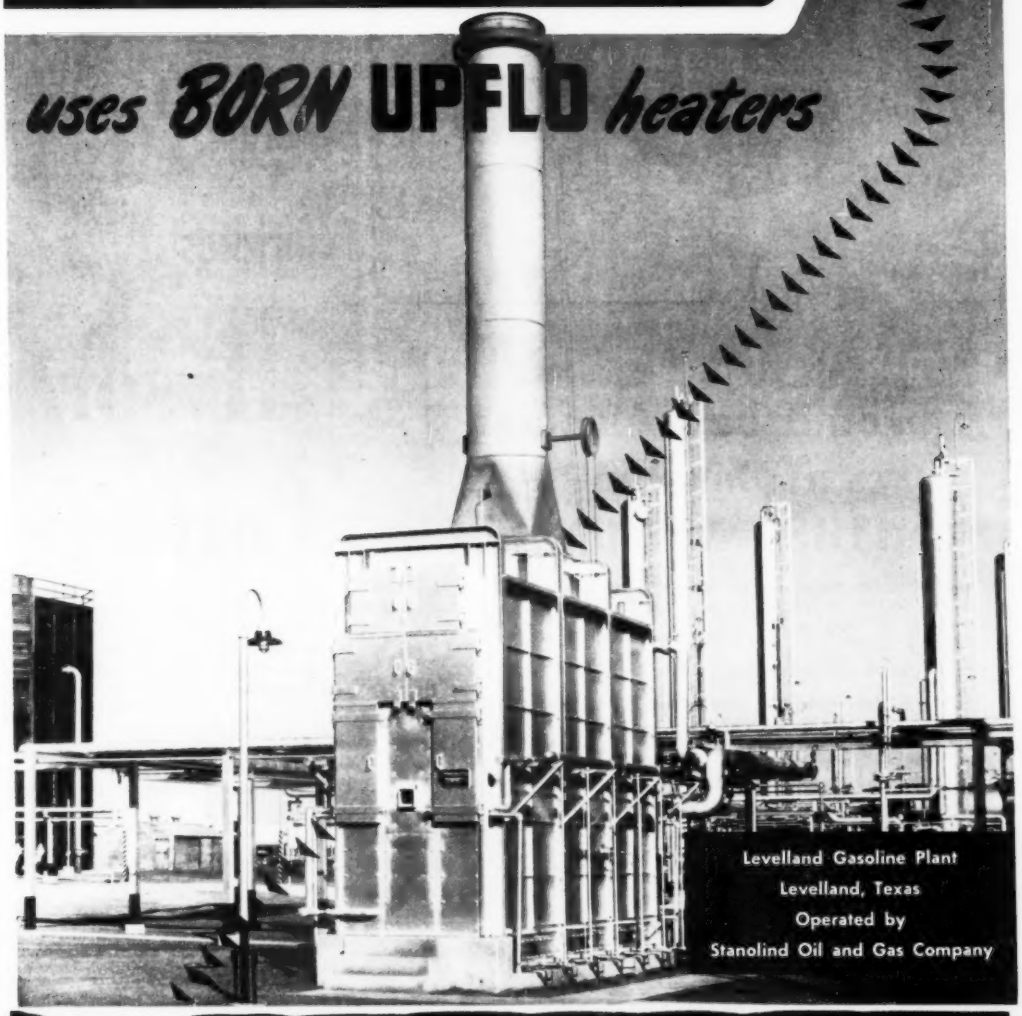

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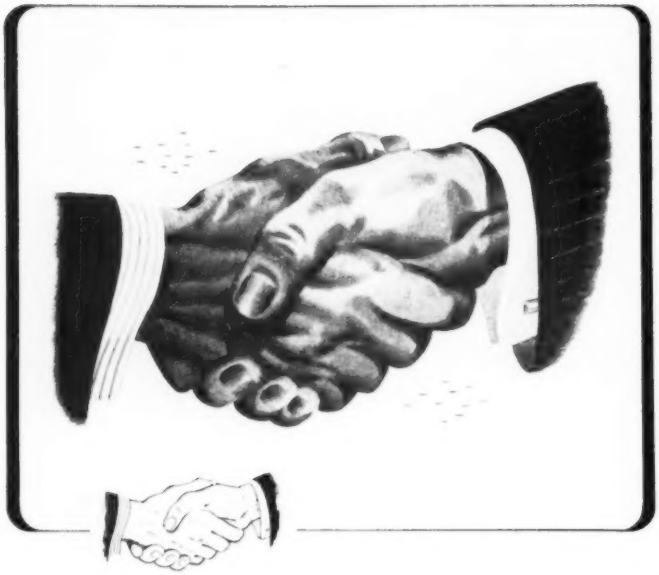

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Survey of Natural-Gasoline Plants

Compiled by The Oil and Gas Journal's Statistical Department

THIS year there are 464 field processing plants in the United States operating to manufacture gasoline and liquefied petroleum gases from natural gas. Total capacity rating on these operations is 22,362,650 gal. daily for all liquids. This capacity plus that of cycling-plant operations in the United States (see page 233) gives a total liquid output from all natural-gas-processing operations of more than 29.6 million gallons daily.

Compared with last year current capacity ratings on all types of natural-gas-processing plants is up 12.7 per cent. Increase in plant capacity for those operating to produce gasoline and L.P.G. only is about 3,000,000 gal. per day.

Texas with approximately 50 per cent of the nation's capacity for producing gasoline and L.P.G. from natural gas showed the greatest gain in capacity during the 1949-1950 period. Capacity in that state was stepped up from slightly more than 9 million to over 11 million gallons daily. Despite reductions in the number of individual plant operations over the previous year brought about by combining various operations into a single plant and placing others on shutdown status, the net increase in the number of operating plants in Texas is nearly 11 per cent. Compared with last year the gain in number of operating plants is 12.

SUMMARY OF NATURAL-GASOLINE PLANTS IN THE UNITED STATES—THEIR DISTRIBUTION AND CAPACITIES

	All plants*		Plants equipped only for production of natural gasoline		Plants equipped for production of natural gasoline and L.P.G.	
	No. of plants	Liquid prod. (cap. gal. per day)	No. of plants	Liquid prod. (cap. gal. per day)	No. of plants	Liquid prod. (cap. gal. per day)
Arkansas	8	315,500	1	10,000	7	305,500
California	70	3,841,100	34	951,000	36	2,890,300
Colorado	1	100,000			1	100,000
Illinois	8	579,300	2	2,000	6	577,300
Kansas	14	543,100	2	17,000	12	526,100
Kentucky	4	110,300	2	10,300	2	100,000
Louisiana	32	1,304,500	9	113,000	23	1,191,500
Michigan	2	45,000	2	45,000		
Mississippi	1	50,000			1	50,000
Montana	1	35,000			1	35,000
New Mexico	8	994,750			8	994,750
Ohio	5	32,550	5	32,550		
Oklahoma	71	2,405,100	25	398,600	46	2,006,500
Pennsylvania	17	86,650	1	9,500	16	77,150
Texas	167	11,152,300	54	1,483,900	113	9,668,400
West Virginia	48	527,900	42	306,750	6	221,150
Wyoming	7	239,600	3	221,500	4	18,100
Total	464	22,362,650	182	3,601,100	282	18,761,750

*Capacity for natural-gasoline manufacture only plus capacity for natural-gasoline and L.P.G. manufacture.

The annual survey of natural-gasoline plants presented here is the most complete of its kind available today. Information on each plant was obtained directly from operating companies by The Oil and Gas Journal.

ARKANSAS

Company, field or plant, and county—	Approx. prod. (gal. per day)
Arkansas Fuel Oil Co., Columbia, Columbia	*105,000
Arkla Oil Co., North Rodessa, Miller	*20,000
Barnsdall Oil Co., Midway, Lafayette	*30,000
Hiwan Oil & Gas Co., Atlanta, Columbia	*25,000
Lion Oil Co., Schuler, Union	*35,000
Magnolia Petroleum Co., Kenova, Union	*5,500
Querbes, J. R., Oil Co., Southfield, Union	10,000
Shell Oil Co., Inc., Magnolia, Columbia	*85,000
Total	315,500

*Includes L.P.G.

CALIFORNIA

Company, field or plant, and county—	Approx. prod. (gal. per day)
Bankline Oil Co., Long Beach, Los Angeles	*17,000
Belridge Oil Co., North Belridge, Kern	*50,000
Brea Canyon Oil Co., Brea-Olinda, Orange	10,000
Coline Gasoline Co., Rincon, Ventura	*50,000
Continental Oil Co., Ventura, Ventura	*45,500
Cowan Oil & Ref. Co., Rosecrans, Los Angeles	10,000
Del Valle Gasoline Co., Del Valle, Los Angeles	*70,000
Fullerton Oil Co., Huntington Beach, Orange	*50,000
General Petroleum Corp.:	
Athens, Los Angeles (fractionating plant)	*210,000
Helm, Riverdale, Lanare, Fresno	*60,000
Santa Fe Springs, Los Angeles	50,000
Ventura, Ventura	40,000
Wilmington, Los Angeles	75,000
Honolulu Oil Corp.:	
Buena Vista Hills, Kern	30,000
Cymric, Kern	*45,000
Inglewood Gasoline Corp., Potrero, Los Angeles	5,000
Lomita Gasoline Co., Long Beach, Los Angeles	*110,000
Lytle, R. S., Operator, Coalinga East, Fresno	*33,000
Magruder, P. S., Operator:	
Kettleman Hills, Kings (Huffman Plant)	*110,000
Kettleman Hills, Kings (Western Plant)	*145,000
Norwalk Co., The:	
Maricopa-Sunset, Kern	*17,000
Santa Fe Springs, Los Angeles	*17,000
Rice Ranch Oil Co., Orcutt, Santa Barbara	3,500
Richfield Oil Corp.:	
North Coles Levee, Kern	*142,000
Long Beach, Los Angeles	20,000
Russell Ranch, San Luis Obispo	*111,000
Shell Oil Co.:	
Brea-Olinda, Orange	25,000
Capitan, Santa Barbara	*5,000
Dominguez, Los Angeles	25,000
Long Beach, Los Angeles	60,000
Santa Maria, Santa Barbara	2,500
Ten Section, Kern	*100,000
Ventura, Ventura	*195,000
Signal Oil & Gas Co.:	
Elwood, Santa Barbara	*25,000
Huntington Beach, Orange	*130,000
Signal Hill, Los Angeles	*75,000
Standard Oil Co. of California:	
(19-B) Coalinga, Fresno	45,000
Greeley, Kern	*70,000
Huntington Beach, Orange	*54,000
Inglewood, Los Angeles	35,000
(11-P) Kettleman Hills, Kings	50,000
(3-P) Kettleman Hills, Kings	*258,000
(33-J) Kettleman Hills, Fresno	50,000
Lost Hills, Kern	4,000
(31-E) Maricopa, Kern	10,000
(1-C) Midway, Kern	*40,000
(7-D) Midway, Kern	33,000
(29-G) Midway, Kern	12,000
Murphy-Coyote, Los Angeles	*120,000
(32-Z) Mountain View, Kern	16,000

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CALIFORNIA (Continued)

Company, field or plant, and county—	Approx. prod. (gal. per day)
Santa Fe Springs, Los Angeles	40,000
Seal Beach, Los Angeles	30,000
Torrance, Los Angeles	12,000
Superior Oil Co., Rio Bravo, Kern	*16,800
Texas Co., The:	
Santa Fe Springs, Los Angeles	*36,000
Signal Hill, Los Angeles	*70,000
Shiells Canyon, Ventura	*50,000
Whittier, Los Angeles	*44,000
Tide Water Associated Oil Co., Ventura Ave., Ventura	*150,000
Union Oil Co.:	
Brea, Orange	35,000
Dominguez, Los Angeles	60,000
Orcutt, Santa Barbara	*29,000
Playa del Rey, Los Angeles	12,000
Richfield, Orange	13,000
Rosecrans, Los Angeles	27,000
Santa Fe Springs, Los Angeles	50,000
Santa Maria, Santa Barbara	*40,000
Unit Operations Naval Petroleum Reserve No. 1 (Std. Calif. Operator), Elk Hills, Kern	6,000
West Coast Refining Co., Richfield, Orange	50,000
West Rosecrans Gasoline Co., Rosecrans, Los Angeles	5,000
Wilmington Gasoline Co., Wilmington, Los Angeles	*100,000
Total	3,841,300

*Includes L.P.G.

COLORADO

California Co., The, Rangely, Rio Blanco	*100,000

*Includes L.P.G.

ILLINOIS

Arkansas Fuel Oil Co., Robinson, Crawford	500
Brenneman & MacDonell, Condry, Crawford (2 plants)	1,500
Carter Oil Co., Loudon, Fayette	*74,000
Engle Petroleum, Inc., Benton, Franklin	*10,000
Texas Co., The:	
Hoodville, Hamilton	*97,500
Salem, Marion	*195,800
Warren Petroleum Corp.:	
Crossville, White	*100,000
Salem, Marion	*100,000
Total	579,300

*Includes L.P.G.

KANSAS

Barnsdall Oil Co., Rainbow Bend, Cowley	*3,000
Cities Service Oil Co. (Del.):	
Main Line, Sedgwick	*104,000
Main Line, Cowley	*30,000
Burrton, Reno	*30,000
Deerfield Petroleum, Inc., Hugoton, Kearny	*40,000
Edwards Gasoline Co., Zenith, Stafford	2,000
Flynn Oil Co., Otis, Rush	*7,000
Kansas P. & L. Co., Medicine Lodge, Barber	15,000
Magnolia Petroleum Co., Hickok, Grant	*85,000
Northern Natural Gas Co., Hugoton, Seward	*61,700
Panhandle Eastern P. L. Co., Hugoton, Seward	*63,000
Skelly Oil Co., Cunningham, Kingman	*30,000
Stanolind Oil & Gas Co., Hugoton, Grant	*64,000
Texas Co., The, Bearden, Cowley	*8,400
Total	543,100

*Includes L.P.G.

KENTUCKY

Ashland Oil & Refining Co., Big Sinking, Lea	2,300
Kentucky-West Virginia Gas Co., Big Sandy, Floyd	8,000
United Fuel Gas Co.:	
Catlettsburg, Boyd	*65,000
Warfield, Martin	*35,000
Total	110,300

*Includes L.P.G.

LOUISIANA

Company, field or plant, and parish—	Approx. prod. (gal. per day)
Anchor Gasoline Corp.:	
Eola, Avoyelles	*40,000
Pine Prairie, Evangeline	*20,000
Cheneyville, Rapides	8,000
Anse La Butte Gasoline Co., Anse La Butte, St. Martin	*12,000
Arkansas Fuel Oil Co.:	
Bisteneau, Webster	*33,000
Langston, Claiborne	5,000
Redessa, Caddo	*15,000
Shreveport, Caddo	*12,000
Sligo, Bossier	*18,500
Atlantic Refining Co., Neale, Beauregard	*40,000
Barnsdall Oil Co., West Tepetate, Jefferson Davis	*32,000
California Co., Hico Knowles, Lincoln	*250,000
Carter Oil Co., Stiles, Caddo	*5,000
Claiborne Gasoline Co., Lisbon, Claiborne	*150,000
Coltexo Corp., Rodessa, Caddo D	*60,000
Continental Oil Co.:	
Gillis, Calcasieu	10,000
Tepetate, Acadia	12,000
Ville Platte, Evangeline	*100,000
Glen Rose Gasoline Co., Rodessa, Rodessa	*50,000
Great National Oil Corp. of Louisiana, Ida, Caddo	35,000
Gulf Refining Co., Homer, Claiborne	10,000
Haynesville Operators Committee, Haynesville, Claiborne	*65,000
Hunt Oil Co., Lisbon, Claiborne	*70,000
Magnolia Petroleum Co., Mamou, Evangeline	*35,000
Ohio Oil Co., Haynesville, Claiborne	*3,000
Shell Oil Co., Iowa, Calcasieu	15,000
Stanolind Oil & Gas Co., Pine Island, Caddo	4,000
Sun Oil Co., Delhi, Richland	*82,000
Texas Co., The, Lafitte, Jefferson	14,000
United Gas P. L. Co.:	
Sugar Creek, Claiborne	*23,000
Koran, Webster	*22,000
Myrtis, Caddo	*54,000
Total	1,304,500

*Includes L.P.G.

MICHIGAN

Company, field or plant, and county—	Approx. prod. (gal. per day)
Michigan Consolidated Gas Co., Reed City, Osceola	40,000
Sun Oil Co., Kimball Lake, Newaygo	5,000
Total	45,000

MISSISSIPPI

California Co., Brookhaven, Lincoln	*50,000

*Includes L.P.G.

MONTANA

Union Oil Co. of California, Cut Bank, Glacier	*35,000

*Includes L.P.G.

NEW MEXICO

Coronado Gas Corp., Loco Hills, Eddy	*25,000
El Paso Natural Gas Co.:	
Jal (1), Lea	*337,500
Jal (2), Lea	*202,500
Maljamar Coop., Maljamar, Lea	*24,750
Phillips Petroleum Co.:	
Eunice, Lea	*120,000
Hobbs, Lea	*105,000
Skelly Oil Co., Eunice, Lea	*130,000
Warren Petroleum Co., Monument, Lea	*50,000
Total	994,750

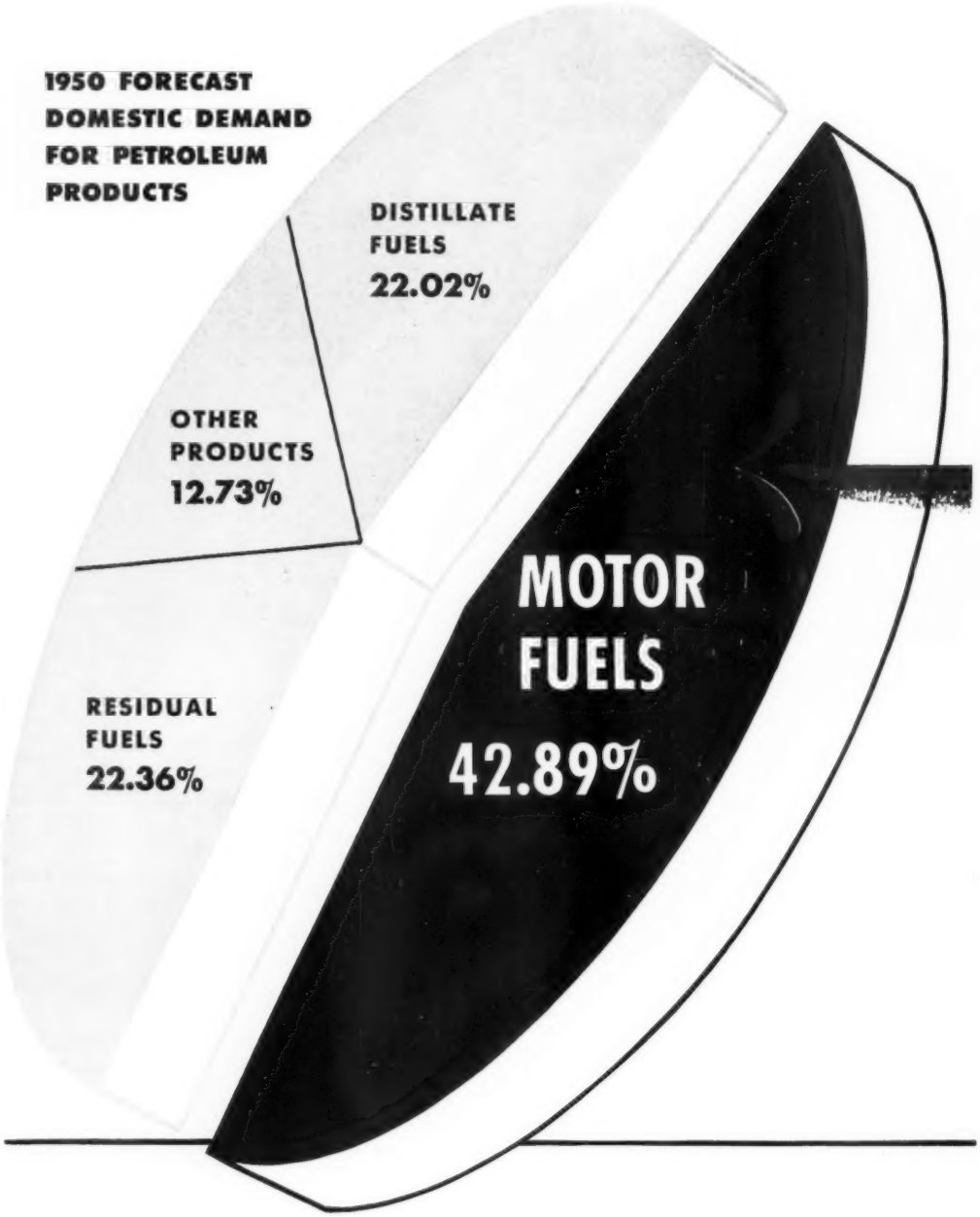
*Includes L.P.G.

OHIO

East Ohio Gas Co., Cuyahoga County	2,550
Ohio Fuel Gas Co.:	
Fairfield County	9,000
Medina County	5,000
Noble County	2,000
Richland County	10,000
River Gas Co., Ludlow, Monroe	4,000
Total	32,550

OKLAHOMA

Apache Gasoline Co., Apache, Caddo	*12,000
Barksdale Co., Barksdale, Hughes	500
Barnsdall Oil Co.:	
Avant, Osage	3,000
Seminole, Pottawatomie	*20,000
Carter Oil Co.:	
Fitts, Pontotoc	*50,000
Seminole, Seminole	*85,600
Cimarron Gasoline Corp.:	
Coyle, Logan	10,000
Guthrie, Logan	15,000
Cities Service Oil Co. (Del.):	
Oklahoma City, Oklahoma	*30,000
Guymon, Texas	20,000
Tallant, Osage	20,000
Sasakwa-Fish, Seminole	20,000
Continental Oil Co., Billings, Noble	*5,000
Crosbie, J. E., Inc.:	
Fitts, Pontotoc	*18,000
Happy Valley, Lincoln	*15,000
Stroud, Creek	*21,000
Devonian Oil Co., Kellyville, Creek	*24,000
Eason Oil Co., Crescent	*50,000
Frame Natural Gasoline Co., Pawnee	2,000
Grimes Gasoline Co.:	
Wetumka, Hughes	*8,500
Arcadia, Oklahoma	*12,000


1950 FORECAST
DOMESTIC DEMAND
FOR PETROLEUM
PRODUCTS
DISTILLATE
FUELS
22.02%
OTHER
PRODUCTS
12.73%
RESIDUAL
FUELS
22.36%
MOTOR
FUELS
42.89%

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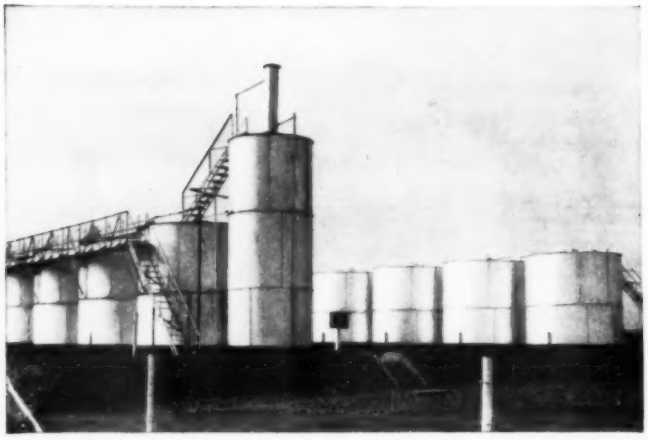

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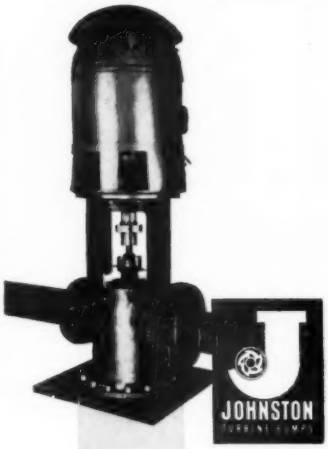

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This unit, which has the pump bowls enclosed in a sealed steel barrel, takes suction sufficiently above the pump bowls to give the required net positive suction head. The discharge can be at the same level as the suction or higher if necessary. Where there is a limited net positive suction head, such a unit offers many advantages:

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2. Driver and piping connections are at the surface, eliminating dry sumps which are costly to build and expensive to maintain.
3. Nothing to lubricate but driver bearings.
4. Vertical design needs only ½ as much valuable floor space.
5. Due to diffuser type construction, this unit has higher efficiencies than conventional centrifugal pumps at high heads.

Technical papers on the Johnston Volatile Liquid Pump are available. Send for as many copies as you need for interested personnel.

JOHNSTON PUMP COMPANY
2324 EAST 49TH STREET
LOS ANGELES 58, CALIFORNIA

OKLAHOMA (Continued)

Company, field or plant, and county—	Approx. prod. (gal. per day)
Grimes, Chas. W. and Otha H.:	
Okemah, Okfuskee	1,000
Weleetka, Okfuskee	*12,000
Grimes, Otha H., Pauls Valley, Garvin	*40,000
Gulf Oil Corp.:	
Kiefer, Creek	*27,000
Mission, Seminole	*11,900
Keener Oil & Gas Co., Custer	*45,000
Lone Star Gas Co., Hollis, Harmon	*20,000
Magnolia Petroleum Co.:	
Davenport, Lincoln	*3,600
Graham, Carter	*6,000
St. Louis, Pottawatomie	*16,000
Sholem Alechem, Stephens	75,000
Mid-Continent Petroleum Corp.:	
Cromwell (7), Seminole	*20,000
Prague, Okfuskee	*6,000
Moore, Cleveland	3,000
Sawyer (3), Creek	*7,500
Stillwater (18), Payne	*11,000
Neale Gasoline Co., Osage, Osage	4,800
Panoma Corp., Guymon-Hugoton, Texas	*134,000
Patton & Swab, Inc., Edmond	*10,000
Peppers Refining Co., Oklahoma City	20,000
Phillips Petroleum Co.:	
Burbank (Denoya), Osage	*55,000
Burbank (Reserve), Osage	*20,000
Edmond, Oklahoma	*210,000
Hunton, Oklahoma	*30,000
Oklahoma City, Oklahoma	*60,000
Wewoka, Seminole	*21,000
Pioneer Corp., Bixby, Tulsa	2,500
Powers, M. F., Depew, Creek	2,000
Pure Oil Co.:	
Cushing, Creek	5,000
Glenn Pool, Creek	6,000
Shell Oil Co.:	
Healdton, Carter	12,000
Hewitt, Carter	*20,000
Lucien, Noble	*30,000
Osage, Osage	10,000
Tonkawa, Noble	10,000
Sinclair Oil & Gas Co.:	
Covington (6), Garfield	*70,000
Drumright (2), Creek	35,000
Seminole (13), Seminole	*210,000
Seminole (12), Seminole	50,000
Shamrock (3), Creek	20,000
St. Louis (14), Pottawatomie	30,000
Skelly Oil Co.:	
Burbank, Osage (3 plants)	*85,000
Velma, Stephens	*50,000
Texas Co., The:	
Davenport, Lincoln	*20,000
Glenn Pool, Creek	6,800
Osage, Osage	*4,400
Tide Water Associated Oil Co., Drumright, Creek	15,000
Universal Gasoline Co., Aylesworth, Marshall	*10,000
Warren Petroleum Corp.:	
Madill, Marshall	*60,000
Maud, Pottawatomie	*30,000
Mayesville, Garvin	*300,000
Total	2,405,100

*Includes L.P.G.

PENNSYLVANIA

Bayliss & Bayliss, Titusville	10,000
Clinger Oil & Gas Co.:	
Tidioute, Fagundus	1,000
Tidioute, Hastings	1,000
Crawford & Gregory, Venango County	100
Ellenburger, W. J., & Sons, Karns City	300
Equitable Gas Co., Rogersville, Greene	10,000
Haskell, Roth & Bayliss, Tidioute, Warren	10,000
Mars Co.:	
Lewis Run, McKean	6,500
Pinegrove, Venango	4,000
Van, Venango	*9,500
Pennsylvania Oil Co., Sheffield, Warren	10,000
Peoples Natural Gas Co., Brave, Greene	20,000
Quaker State Oil Refining Co., McDonald, Allegheny	2,500
Surety Oil Co.:	
Tiona, Warren	500
Titusville	1,000
Trueman's Forrest	150
W. Paul Wible, Butler County	100
Total	86,650

*Includes L.P.G.

TEXAS

Abercrombie Co., J. S., Old Ocean, Brazoria	*320,000
American Republics, Joes Lake, Tyler	15,000
Anzak Oil Corp., Overall, Coleman	*200
Arkansas Fuel Oil Co.:	
Carthage, Panola	*30,000
Panola, Panola	*125,000
East Texas, Gregg	*75,000
Smithland, Marion	5,000
Rodessa (Jefferson area), Marion	*30,000
Waskom, Harrison	*95,000
Atlantic Refining Co., Block 31, Crane	†20,000
Barnhart Hydrocarbon Corp., Barnhart, Reagan	*100,000
Bennett Oil & Refining Co., Refugio, Refugio	20,000
Big Lake Oil Co., Big Lake, Reagan	50,000
Cabot Carbon Co.:	
Keystone, Winkler	*66,500
North Ward, Ward	*30,000
Canadian River Gas Co., West Panhandle, Moore	56,000
Cannon Gasoline Co., Panhandle, Potter	*15,000
Carthage Corp., Carthage, Panola	*500,000
Caska Corp., Quitman, Wood	15,000
Chicago Corp., Carthage, Panola	*300,700
Cisco Hydrocarbon Corp., Curry, Stephens	*40,000
Cities Service Oil Co. (Del.):	
Chico, Wise	*34,000
North Cowden, Ector	50,000
Pampa, Gray	*50,000
Coltexo Corp., Panhandle, Gray	50,000
Columbian Gasoline Corp., Panhandle, Wheeler	25,000
Consolidated Gasoline Co., Martin, Eastland	10,000
Continental Oil Co.:	
K.M.A., Wichita	125,000
Rincon, Starr	*31,500
Todd Ranch, Crockett	*85,000
Danciger Oil & Refining Co., Pledger, Matagorda	*40,000
Del Rey Petroleum Co., Chesterville, Colorado	*25,000
Duval Gasoline Co., Benavides, Duval	*17,000
El Paso Natural Gas Co., Sealy-Smith, Ward	*42,000
E. Texas Prod. Gas., Chapel Hill, Smith	†20,000
Fullerton Oil Co., Fullerton, Andrews	120,000
Gregg-Tex Gasoline Corp., East Texas, Gregg	*200,000
Grimes, Otha H., Eskota, Fisher	*8,000
Gulf Oil Corp.:	
East Texas, Gregg	*168,000
East Texas, Rusk	*42,000
North Ward-Estes, Crane	30,000
Sand Hills, etc., Crane	*195,000
Henderson Trust No. 2, W. Panhandle, Hutchinson	50,000
Hilander Gasoline Co., Rogers, Montague	*6,000
Huber, J. M., Corp., Panhandle, Hutchinson	29,000
Humble Oil & Refining Co.:	
American, Rusk	55,000
Anahuac, Chambers	25,000
Clear Lake, Friendswood, Harris	*35,000
Conroe, Montgomery	12,500
Flour Bluff, Nueces	8,100
Heyser, Calhoun	7,300
Kilgore, Rusk	36,000
London, Rusk	*92,000
Tomball, Harris	21,000
Tom O'Connor, Refugio	*26,000
Hunt Oil Co., Harleton, Harris	*30,000
La Gloria Corp., La Gloria, Jim Wells	*35,000
Lisbon Gasoline Co., East Texas, Rusk	*100,000
Lone Star Gas Co.:	
Gordon, Palo Pinto	*45,000
Pueblo, Eastland	7,000
Trinidad, Henderson	*80,000
Lone Star Producing Co.:	
Brooks, Stephens	25,000
Ranger, Eastland (fractionating plant)	*75,000
Plant 108, Eastland	60,000
Lyman, C. V., Gasoline Co., Emperor, Winkler	*20,000
Magnolia Petroleum Co.:	
Burkburnett, Wichita	*6,000
Desdemona, Eastland	*6,500
Electra, Wilbarger	*6,000
Kermit, Winkler	*18,000
Olden, Eastland	*4,500
Sabine, Gregg	*80,000
Vanderbilt, Jackson	*35,000
Manning, Fred M., McKnight, Throckmorton	†6,000
McCarthy Chemical Co.:	
Stonewall-Jackson Pasture, Jefferson	*105,000
Stonewall-Jackson Pasture, Jefferson	*275,000
Mid-Co Gasoline Co., Cayuga, Henderson	*10,500
Midland Gasoline Co., Conroe, Montgomery	*75,000
Monerief, W. A., & Sons:	
Wichita-K.M.A.	*4,000
Nash Gasoline Co.:	
James, Young	*8,000
South Bend, Young	*12,000

TEXAS (Continued)

Company, field or plant, and county—	Approx. prod. (gal. per day)
Natural Gasoline Corp., Hawkins, Wood	*100,000
Nine Oaks Gasoline Co., Gladewater, Gregg	700
Nueces Corp., Agua Dulce, Nueces	†14,000
Odessa Natural Gasoline Co., Foster, Ector	*65,000
Panoma Corp., W. Panhandle, Carson	*100,000
Parade Co., East Texas, Rusk	*225,000
Petroleum Reserve Corp., Piedra Pintas, Duval	600
Pewitt, P. H., Joaquin, Shelby	2,000
Phillips Petroleum Co.:	
Bowers, Gray	*19,300
Canadian, Hutchinson	*34,000
Crane, Crane	*50,000
Dumas, Moore	*36,000
Fullerton, Andrews	*192,000
Goldsmith, Ector	*112,000
Gray, Gray	*73,000
Hansford, Hansford	*57,000
Judkins-Harper, Ector	*65,000
Lefors, Gray	*39,000
Lodi, Cass	34,000
Mankins, Wichita	*43,000
North, Gray	*46,000
Pampa, Gray	*44,000
Pantex, Hutchinson	*21,000
Rock Creek, Hutchinson	*107,000
Sanford, Hutchinson	*62,000
Seminole, Gaines	*43,000
Sherman, Hansford	*130,000
Sneed, Moore	*126,000
Pioneer Gasoline Co., Pioneer, Eastland	*5,000
Portland Gasoline Co., Panhandle, Gray	*40,000
Pure Oil Co., Van, Van Zandt	*65,000
Roeser & Pendleton:	
Plant 1, Shackelford	5,000
Plant 3, Shackelford	500
Rudco Oil & Gas Co.:	
Desdemona, Eastland	5,000
Rising Star, Brown	5,000
St. Marys Oil & Gas Co.:	
Colony, Callahan	34,000
Moran, Shackelford	6,000
Shamrock Oil & Gas Corp., The, Panhandle, Moore	*460,000
Shell Oil Co.:	
Panhandle (1), Carson	5,000
Panhandle (2), Carson	25,000
Panhandle, Gray	15,000
Provident City, Lavaca	*†106,700
T-X-L, Ector	*370,000
Wasson (1), Yoakum	34,000
Wasson (2), Yoakum	*310,000
Sinclair O. & G. Co.:	
Gladewater (18), Gregg	*275,000
East White Point (20), San Patricio	*30,000
Troup (19), Rusk	*120,000
Skelly Oil Co.:	
West Pampa, Gray	100,000
Burkburnett, Wichita	4,500
Carson, Hutchinson Counties (3 plants)	*125,000
Southern Minerals Corp.:	
Saxet, Nueces	*27,500
Stratton, Nueces	*46,000
Standard Oil Co. of Texas:	
Sivells Bend, Cooke	*42,000
Stanolind Oil & Gas Co.:	
Levelland, Hockley	*134,000
Luby, Nueces	*43,000
Hastings, Brazoria	*60,000
Slaughter, Hockley	*250,000
Sun Oil Co.:	
Jameson, Coke	*40,000
Sun, Starr	*102,000
Texas Co., The:	
Burkburnett, Wichita	5,800
Chalk Hill, Archer	*10,000
Electra, Wichita	*18,500
Texas Natural Gasoline Corp.:	
Benedum, Upton	*200,000
Santa Rosa, Pecos	*30,000
Walnut Bend, Cooke	*50,000
Wimberly, Jones	*88,000
Texas Pacific Coal & Oil Co., Caddo, Stephens	*20,000
Texoma Natural Gas Co.:	
Panhandle, Hutchinson	85,000
Panhandle, Moore	44,000
Tide Water Associated Oil Co.:	
Long Lake, Anderson	*4,000
Cayuga, Anderson	*7,000
Sublime, Colorado	21,000
South Stinton, San Patricio	1,300
Tucker Oil Co., Burkburnett, Wichita	1,500
United Gas Pipe Line Co.:	
Agua Dulce, Nueces	*49,000
Carthage, Panola	*400,000
Karnes City, Karnes	*50,000
Waggoner, W. T., estate, Waggoner, Wilbarger	7,000
Warren Petroleum Corp.:	
Breckenridge, Stephens	*55,000
Fairbanks, Harris	*25,000
East Texas, Gregg	*190,000
Holliday, Archer	*110,000
McLean, Gray	*50,000
Madden, Wichita	35,000
West Gasoline Co., Cleveland, N. McCoy, Liberty	*15,000
West Texas Gas Co., W. Panhandle, Potter	20,000
Total	11,152,300

*Includes L.P.G. †Estimated.

WEST VIRGINIA

Company, field or plant, and county—	Approx. prod. (gal. per day)
Carnegie Natural Gas Co., (entire holdings), Wetzel County	*750
Dinsmoor & Co., St. Mary's, Sugar Creek, Shawnee, Henry Camp, Bills 10-Acre, Fetty, Roby, Brush Run and Pike (2 plants)	200
Falling Rock Channel Coal Co., Falling Rock	3,000
Hapgood, Roswell T., & Co., Cedar Grove, Kanawha	5,000
Hope Natural Gas Co.:	
Cornwell, Kanawha	20,000
Hastings, Wetzel	*200,000
Kennedy, Lewis	30,000
Waverly, Wood	20,000
Owens, Libby-Owens Gas Dept., Kanawha County	15,000
Pure Oil Co. (Dawes), Cabin Creek	*9,000
Quaker State Oil Refining Corp., Wetzel County (2 plants)	8,750
South Penn Natural Gas Co.:	
Bennett, Gilmer	500
Blackshere, Marion	800
Broadwater, Tyler	300
Clay, Clay	2,500
Coldwater, Harrison	300
Copley, Lewis	800
Edgell, Roane	1,200
Fairview, Monogalia	3,000
Falling Rock, Kanawha	1,000
Griffith, Lincoln	2,000
Hartley-Stephens, Ritchie	2,600
Liverpool, Jackson	500
Lynch, Harrison	3,500
McElroy, Tyler	500
Metz, Marion	1,200
Morgan, Wetzel	3,000
Oilsiding, Kanawha	500
Pine Grove, Wetzel	3,500
Prutny, Ritchie	300
Rock Creek, Roane	1,200
Seckman, Tyler	500
Shinnston, Harrison	500
Stringtown, Tyler	3,000
Sweeney, Tyler	500
Tanner, Gilmer	3,000
Victor, Kanawha	3,500
Wood, Elk Fork, Eddy, Tyler	1,000
Manufacturers Light & Heat Co.:	
Jane Lew, Lewis	3,000
Moundsville, Marshall	3,000
Porters Falls, Wetzel	10,000
United Fuel Gas Co.:	
Charleston, Kanawha	*22,000
Clendenin, Kanawha	40,000
Hubball, Lincoln	*45,000
Ona, Cabell	18,000
St. Albans, Kanawha	3,500
Sandyville, Jackson	*30,000
Wheeling Steel Corp., Follansbee, Brooke	500
Total	527,900

*Includes L.P.G.

WYOMING

Company, field or plant, and county—	Approx. prod. (gal. per day)
Continental Oil Co., Lance Creek, Niobrara	*65,000
Northern Utilities Co., Sand Draw, Fremont	4,500
Ohio Oil Co., The:	
Grass Creek, Hot Springs	3,600
Rock River, Albany	*7,500
Sinclair Oil & Gas Co., Lost Soldier, Sweetwater	10,000
Stanolind Oil & Gas Co.:	
Salt Creek, Natrona	*93,000
Elk Basin, Park	*56,000
Total	239,600

*Includes L.P.G.

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ON YOUR OIL FIELD TRENCHING JOBS

YOU CAN DEPEND ON MORE TRENCH—
IN MORE PLACES—AT LESS COST

CLEVELANDS multiple transmission-controlled speed combinations give you the fastest and best speed for every job condition. Their wide crawler mounting, accessible controls and full operator visibility make for maximum maneuverability with operating ease and comfort. The rugged, all-welded frame and boom, constructed from the tougher steels, absorb all shocks and strains, keeping these units in alignment. Unit-type construction cuts service and maintenance time to a minimum and low fuel consumption cuts operating costs. These are but a few of the many practical reasons why CLEVELANDS deliver superior performance, doing your oil field trenching jobs quicker, easier and cheaper.

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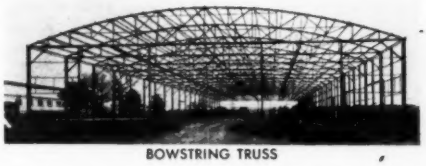

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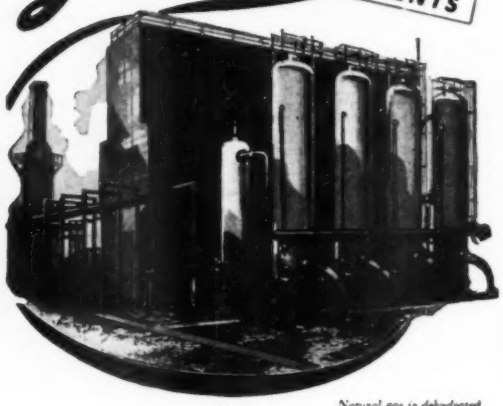

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acts many parts

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Bleaching Agent	Catalyst	Filler
Colloidal Gel	Catalyst Carrier	Suspension Builder
Flocculant	Catalyst Binder	

in many uses

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Dehydrogenation	Treatment of Waste
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Water Treatment
Formulation of Insecticides and Fungicides

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DOES THIS SOLVE YOUR PANELBOARD PROBLEM?

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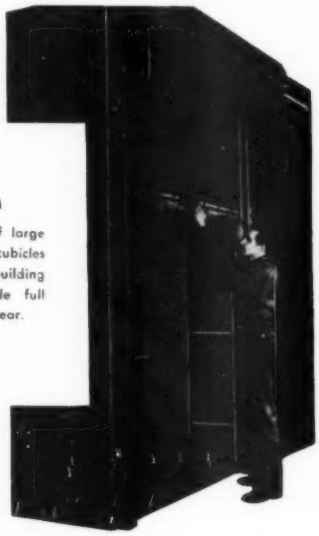

PROBLEM

Erect a bank of large power house cubicles close to the building wall yet provide full easy access to rear.

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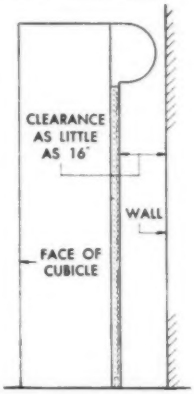
SOLUTION — FALSTROM cubicles designed and fabricated for easy mounting of steel overhead rolling doors.

Eight of these big (10 ft. high) cubicles had to be set up in a control room with only 16 inches clearance between the rear of the cubicles and the wall. Not enough swing room for rear doors—not even the Falstrom folding type. Moreover, provision had to be made for securing cubicle under lock and key.

These rolling doors were an admirable solution. Door head fitted well within the limit. Opening was quick and easy and accessibility to all internal equipment was excellent. Lock was neatly fitted to flange at bottom of door.

Whether your problem concerns a standard panelboard or a special case, it pays—when you figure on panelboard—to figure on FALSTROM.



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Survey of Cycling Plants

PRODUCTION capacity of cycling-plant operations in the United States now totals 7,251,800 gal. of liquid daily for all installations. This capacity, slightly higher than last year's figure, is the total of 52 cycling plants operating in seven states. These capacity ratings are compiled from data obtained through The Oil and Gas Journal's annual survey of operations in the natural-gas-processing industry.

Capacity ratings on cycling-plant operations in Texas represent about 61 per cent of the total for the nation. Louisiana, in second place, accounts for 23 per cent of the country's capacity and, in third position, California has nearly 10 per cent.

Liquefied petroleum gases are produced by 34 of the 52 operating plants. Capacity rating on those plants not equipped to extract L.P.G. runs to 10.8 per cent of the total for all plants.

Compared with last year the number of plants equipped with facilities for extracting L.P.G. in addition to natural gasoline and other cycling products, is up about 11 per cent. This increase is approximately the same as the over-all increase in total number of plants for the same period.

Cycling operations in the seven states are carried out by 40 different companies. A few of these companies operate cycling plants in more than one state. Operations in Texas are represented by 31 companies.

Capacity ratings on natural-gasoline plant operations in the U. S. are given on page 223. Both cycling and natural-gasoline-plant operations are compiled by The Oil and Gas Journal statistical staff from data obtained directly from operating companies.

SUMMARY OF CYCLING PLANTS IN THE UNITED STATES — THEIR DISTRIBUTION AND CAPACITIES

	All plants*		Plants equipped only for production of natural gasoline		Plants equipped for production of natural gasoline and L.P.G.	
	No. of plants	Liquid prod. (cap. gal. per day)	No. of plants	Liquid prod. (cap. gal. per day)	No. of plants	Liquid prod. (cap. gal. per day)
Arkansas	1	208,800	0		1	208,800
California	3	694,000	0		3	694,000
Colorado	1	27,000	1	27,000	0	
Louisiana	7	1,678,600	1	75,600	6	1,603,000
Mississippi	1	175,000	0		1	175,000
Oklahoma	1	57,000	1	57,000	0	
Texas	38	4,411,400	15	623,900	23	3,787,500
Total	52	7,251,800	18	783,500	34	6,468,300

*Capacity for natural-gasoline manufacture only plus capacity for natural-gasoline and L.P.G. manufacture.

ARKANSAS

Company, field or plant, and county—	Approx. prod. (gal. per day)
McKamie Gas Cleaning Co., McKamie, Lafayette	*†208,800

*Includes L.P.G. †Distillate stabilization cap. 150,000 gal. per day.

CALIFORNIA

Barnsdall Oil Co., Newhall, Los Angeles	*50,000
Ohio Oil Co. (Operator), South Coles Levee, Kern	*284,000
Western Gulf Oil Co. (Operator), Paloma, Kern	*360,000
Total	694,000

*Includes L.P.G.

COLORADO

Continental Oil Co., McCallum, Jackson	27,000

LOUISIANA

Company, field or plant, and parish—	Approx. prod. (gal. per day)
Barnsdall Oil Co., Benton, Bossier	*210,000
California Co., The, Lake St. John, Tensas	*175,000
Cotton Valley Operators Comm., Cotton Valley, Webster	*388,000
Southwest-Feazel, Dubach, Lincoln	*100,000
Stanolind Oil & Gas Co., South Jennings, Jefferson Davis	*58,000
Texas Co., The, Operator, Erath, Vermilion	*672,000
Texas Co., The, Bateman Lake, St. Mary	75,600
Total	1,678,600

*Includes L.P.G.

MISSISSIPPI

Company, field or plant, and county—	Approx. prod. (gal. per day)
California Co., The, Cranfield, Adams	*175,000

*Includes L.P.G.

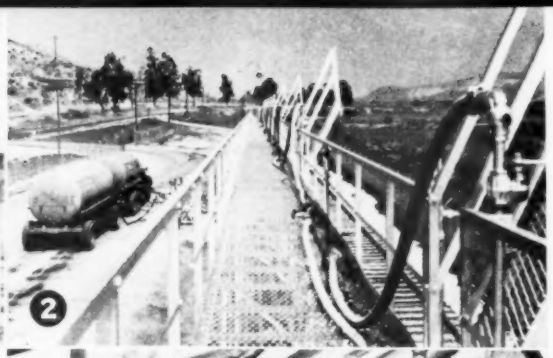
OKLAHOMA

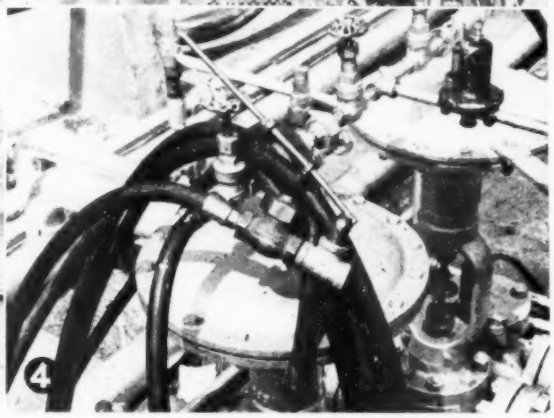
Company, field or plant, and county—	Approx. prod. (gal. per day)
Magnolia Petroleum Co., Chitwood, Grady	57,000

TEXAS

Company, field or plant, and county—	Approx. prod. (gal. per day)
Agua Dulce Co., The, Agua Dulce, Nueces	*40,000
American Liberty Oil Co., Blessing, Matagorda	40,000
American Republics, Silsbee, Hardin	*135,000
Anco Gas Corp., Long Lake, Anderson	60,000
Big Lake Oil Co., Big Lake, Reagan	80,000
Chicago Corp., The:	
Stratton, Nueces (Gulf Plains)	*150,000
Stratton-Agua Dulce, Nueces (Coastal Plant)	*150,000
Stratton-Agua Dulce, Nueces (Wardner Plant)	*150,000
Distillate Prod. Corp., North Houston, Harris	*51,500
Duval Gasoline Co., Southland, Duval	5,000
Federal O. & G. Industries, Inc., Joyce Richardson, Harris	8,400
Francitas Gas Co., Francitas, Jackson	*55,000
Gasoline Production Corp., Bee	65,000
Geier-Jackson, Inc., Grapeland, Houston	*80,000
Gillring Oil Co., Agua Dulce, Nueces	*40,000
Gray-Wolfe Co., Pinehurst, Montgomery	†20,000
Hamman Expl. Co., Hamman, Matagorda	†20,000
Harrell, H. M., Ehrhardt, Harris	40,000
Humble Oil & Refining Co., Katy, Waller	*585,000
La Gloria Corp., La Gloria, Jim Wells	*327,500
Lone Star Production Co.:	
Grapeland, Houston	*18,000
Opelika, Henderson	*100,000
Carthage, Panola	100,000
Chapel Hill, Smith	*130,000
Magnolia Petroleum Co., Seeligson, Jim Wells	*500,000
Plymouth Oil Co., Plymouth, San Patricio	75,000
Plomo Co., Brayton, Nueces	†50,000
Roeser & Pendleton, Cayuga, Anderson	2,000
Shell Oil Co., Sheridan, Colorado	*282,000
Stanolind Oil & Gas Co.:	
La Rosa, Refugio	*50,000
Burnell-North Pettus, Bee	*287,000
Standard Oil Co. of Texas	*73,500
Superior Oil Co., Lake Creek, Montgomery	*462,000
Tide Water Associated-Seaboard:	
Cayuga, Anderson	*22,000
Long Lake, Anderson	*23,000
Trinity Gas Corp., Sejita, Duval	*76,000
Westcol Oil & Gas Co., Nordheim, DeWitt	†25,000
Western Natural Gas Co., San Salvador, Hidalgo	33,500
Total	4,411,400

*Includes L.P.G. †Estimated.





Loading Racks Designed for Utmost in Safety and Utility

1—Barnsdall Oil Co.'s loading rack for Newhall, Calif., gasoline plant. Men are preparing wire-line barricade to prevent vehicles from entering while loading rack is in operation.

2—Method of connecting loading hose with mechanical swivels.

3—Tank truck being loaded with propane or butane at manifold "island."

4—Loading control on "off" position, showing globe valve with sawed-off stem, and sliding sleeve with nipple to depress stem against pressure (see discussion in article).

WHEN Barnsdall Oil Co., California division, expanded the facilities for extracting liquid fractions from field gas produced from its big Rancho San Francisco lease in Pico Canyon, near Newhall, Calif., the problem of shipping 70 to 80 thousand gallons of finished products daily by tank car and tank truck and trailer presented itself.

Major portion of the producing area is located in a large amphitheater-like canyon. It is surrounded on all sides by hills the size of small mountains, and the roads into and out of the basin contain switchbacks on steep grades, making heavy traffic difficult to handle. Therefore, a railroad loading rack was built, separated from the gasoline plant and producing area by one range of hills and the Santa Clara River. A three-lane state highway parallels this railroad and provides access by truck and trailer to the loading rack, and has connections with all main arterial boulevards.

Many modern loading racks were visited by Barnsdall engineers to select the best features of each so that the projected facilities might be operated with reasonable dispatch and employe security. The final decision was made to use steel throughout so far as possible in order to eliminate any material that might be inflammable and subject to rot and deterioration. As built, the entire facilities represent almost 100 per cent salvage, excepting of course, the concrete and labor going into the building of the rack.

Location of Plot

The plot selected is located on the first bench above the river bed out of the range of any possible flood, is level and well drained. The structure is set on concrete piers high enough above the surface of the sandy soil to prevent creep of ground moisture to the loading headers during the rainy season.

Somastic-coated pipe lines conduct the finished products, propane, butane, and natural gasoline, from plant storage to the loading rack. The river crossing was made by trenching at low water mark below the turbulent area of shifting quicksands and deep enough below water level to eliminate difficulty by pipeline breakage. The lines emerge from the sandy soil at the loading rack with vertical risers to connect with the horizontal loading headers carried on the bottom sills of the loading-rack structure. The pipe lines are all welded and each sharp turn makes use of welding ells; welded flange fittings provide setting for control gates and instruments.

Design of the rack provides loading spots for 10 tank cars and two truck and trailer units. The standards rising vertically from the commodity headers, in the base of the rack, are fitted with long synthetic-rubber loading hose for flexibility. Each hose is clamped to its connection fittings which attaches directly to lubricated swivel joints, for maneuverability and to prevent damage to the hose due to sharp kinks.

The control valve for shutting off the flow of commodities is located in the riser just above the rack guard rail where the riser is clamped se-

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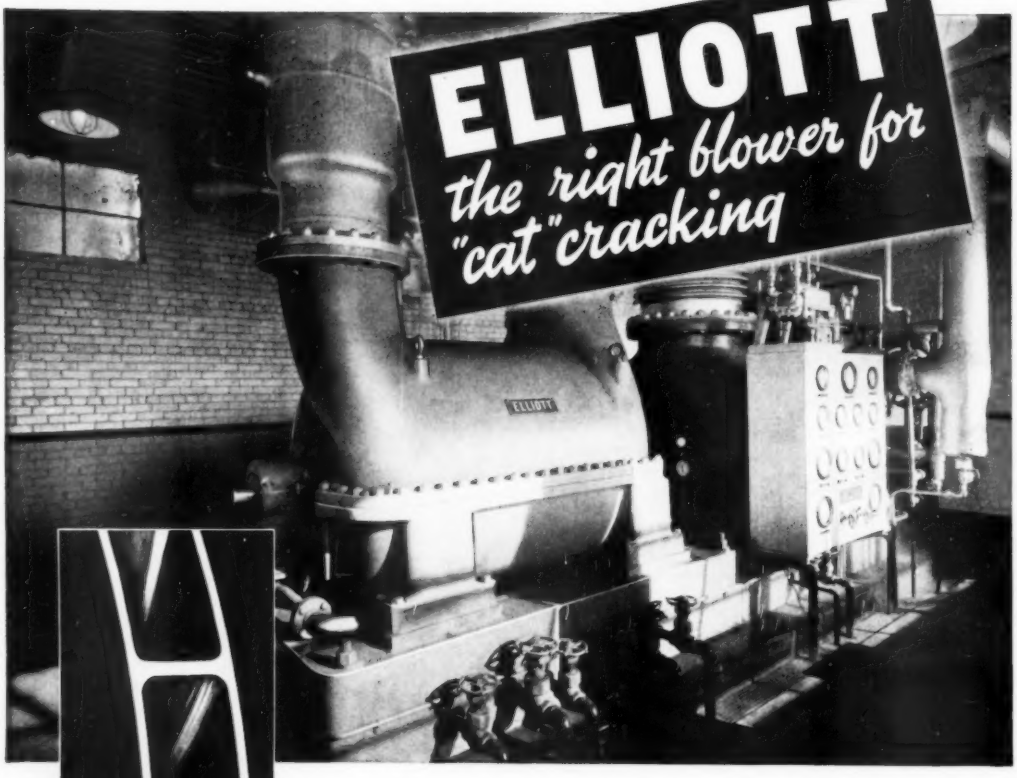

WELDED IMPELLERS are one of the many reasons why Elliott blowers are getting ever-increasing acceptance for process work. Note the smooth contours, heavy blades, and generally rugged construction (as compared to conventional riveted impellers). Each impeller is a completely homogenous unit and can be made of any weldable material having reasonable mechanical strength.

THIS ELLIOTT TURBINE-DRIVEN AIR BLOWER serves the new fluid "cat" cracker which recently went into service at the Big Spring, Texas, refinery of Cosden Petroleum Corporation. It provides the air for conveying and reactivating the catalyst. Installed at an elevation of 2600 feet above sea level (13.3 psia barometer), this blower is rated at 15,500 inlet cfm and discharges at a pressure of 25 psig. It is direct-connected to an Elliott 1575-hp condensing steam turbine operating at 5900 rpm.

Continuity of operation is an essential of "cat" crackers and other process requirements—an emergency shutdown may result in serious damage to equipment and prolonged loss of production. Elliott units have been designed with this requirement in mind and operating records prove conclusively that they have the rugged dependability necessary to meet the most exacting requirements. Contact your nearest Elliott representative for details.

P-1090

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curely with a welded bracket. The control valve, a double-disk quick-open-and-shut fitting, is located in easy reaching distance for the loading-rack operator, to enable him properly to top out a tank car.

Structural frame of the rack is made of angle iron with riveted connections which leaves the smooth round heads inside the rack. Sills for the floor are crossbraced to promote rigidity and to support any normal load imposed on the structure. The floor is constructed of expanded metal to prevent accumulation of dirt.

Access to spotted tank cars is provided with balanced all-steel walkways equipped with scissor-type guard rails. Flooring of these balanced walkways is also constructed with expanded metal

Loading Truck and Trailer Units

The two islands built for loading truck and trailer units are conveniently near the tank-car loading rack to provide for short pipe-line connections, and are built of reinforced concrete. Heavy members are built at each end of the island, coming to a curved end. The side of the island facing the truck roadway is a solid vertical curb integral with the pointed ends and reinforced with six right-angle piers which separate the space between each end piece into six separate "stalls." These stalls serve as a resting place for the loading hose when the rack is idle.

Safety is built into the loading islands at this rack by equipping the feed lines with diaphragm valves, operated by compressed air, which function to shut off the flow of commodities instantly. The air is supplied by an electric-motor-driven compressor placed in the loading rack dog house at a safe distance from any inflammable material. To prevent escape of gasoline or vapors, each loading line is equipped with bleeders between the control valve and the truck units to release excess material back into the vent line.

An ingenious device has been developed to control the pressure of the air on the control valve diaphragm so as to shut off the flow of gasoline instantly. A small all-brass globe valve was disassembled so that the stem might be cut short so that, when the disk was seated, end of stem was about $\frac{3}{8}$ in. below top of the stem packing gland.

The valve is assembled on a long section of air hose, with the valve in a position so air pressure might flow against the bottom of the disk to force it open if not held tightly closed.

Construction.—The opposite end of this hose is attached to the air inlet fitting of the top of the diaphragm case of the automatic control valve so that air can flow into the diaphragm case, or escape directly through the hose to atmosphere. An all-thread nipple screwed into outlet end of the globe valve carries a com-

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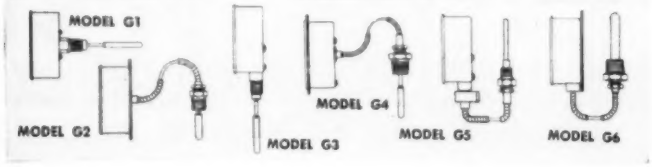

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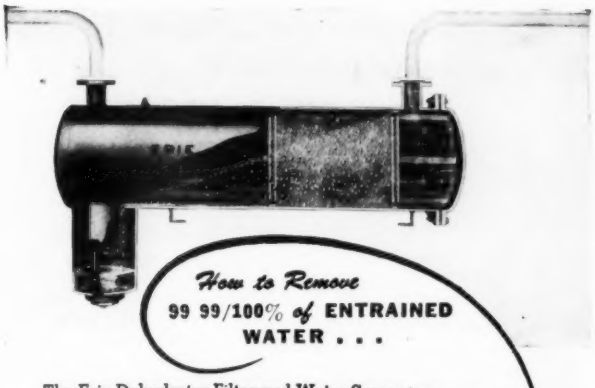
mon tee in running position but adjusted so the side outlet is in a direct line with the top of the valve stem packing gland. A short bull plug was prepared as an anchor and hinge to attach a long steel handle that passes directly back across the brass globe valve. This handle was fitted with a free-running sleeve to which is attached a short projection that fits easily in the opening of the globe valve-stem packing gland, and long enough to depress the shortened stem and disk tightly against the valve seat. A retainer, attached with a set screw, prevents the free-running sleeve from slipping off the handle, but permits a long range of travel for the sleeve and projection.

Purpose of this free-running sleeve, and its projection is to enable the operator to release instantly the air pressure on the diaphragm chamber of the automatic loading valve in the commodity line. By carefully fitting the projection on the sleeve directly into the packing gland of the globe valve so the end will press against the cutoff stem, the operator can retain air pressure on the diaphragm, but the instant he relaxes the air will escape to the atmosphere and dislocate the projection, which immediately closes the automatic loading valve by removing pressure on the diaphragm.

Each time the operator desires to maintain flow of commodity through the loading line, he must fit the projection into the globe valve stem packing gland and keep a firm hold by compressing the handle tightly. Therefore, if an accident should occur, such as a faulty connection on the tank truck, he needs only to drop the hose to close the diaphragm valve. Automatically, the air is released and the flow of commodities is stopped. Only when the sliding sleeve and nipple are again placed in operating position can the air pressure build up in the diaphragm chamber to open the automatic valve to permit loading to be resumed.

The rack structure and loading lines are electrically grounded at several points to the rails of the loading spur with copper cables which also ground the tank cars to the loading rack. Lighting of the rack is obtained with tall gooseneck fixtures so that illumination is spread over the entire area.

To obtain spot samples of the products flowing to the loading headers, withdrawal fittings are set into the risers of the commodity lines where they emerge from the ground to extend across the concrete supporting piers. The loading-rack operator can shut off all lines against the loading pump at the gasoline plant because of pressure controls at that point which stalls the pump without excess pressure on the pipe lines. Opening a loading valve again releases the controls on the loading pump so commodities can flow freely again.



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INTERESTING NEW "SMALL" PLANT located in Chalk Hill field, Archer County, Texas, has two 225-hp. compressors. It will handle 2 million cubic feet daily at 15 psig., and compress 660 M.c.f. to 1,800 psig. for repressure service. It is manufacturing 6.47 gal. of liquid products per thousand cubic feet.

Chalk Hill Plant Illustrates Manufacture-Repressure Design

by J. D. Glidden*

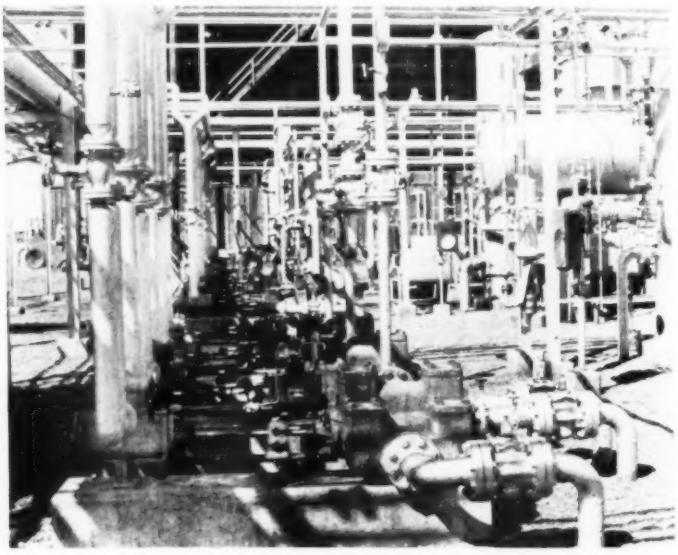
A DEETHANIZING absorber, with an absorption section above and a stripping section below the feed tray, is the most unusual feature of the recently completed Chalk Hill, Tex., gasoline plant. This new installation is jointly owned by The Texas Co., Texas Natural Gasoline Corp., and W. A. Moncrief & Sons. The Texas Co. is the operator.

This modern new plant is designed to process 2,000 M.c.f. daily of casinghead gas from Chalk Hill oil field, near Wichita Falls, Archer County. In addition to gasoline recovery, the plant will provide 660 M.c.f. daily of dry gas at 1,800 psig. for field repressuring.

The wet gas is separated from the crude oil in the field separators at about 15 psig. and at flowing temperature. It is then brought by pipe line to the plant where it is compressed to a discharge pressure of approximately 240 psig. This is done in two stages by two 225-hp. compressors. These compressors are also equipped with two high-pressure cylinders each for compressing absorber residue from 220 to 1,800 psig. in two stages for repressuring.

*O. L. Olsen, Houston.

Pumps operate on 300-psig. steam, exhaust at 125 psig. to furnish stripping steam to still and for heating reboiler.



After compression and cooling, the gas stream and compression condensate enter the unique deethanizing absorber at 235 psig. without separation. All the methane and nitrogen are removed from the feed by the stripping section. The majority of the ethane is also removed in order to make propane having the desired vapor pressure. The absorption section is equipped with an inner cooler. Design lean-oil circulation rate for this tower is 75 g.p.m. for 2,000 M.c.f. daily of wet gas.

The bottom of the stripping section is heated by exchanging the rich oil from the bottom tray with the lean oil from the bottom of the still. Further heating is furnished by a steam trimmer operating with steam at approximately 280 psig.

Rich oil from the bottom of the deethanizing absorber is fed to a direct-fired rich-oil heater, whence it goes to the steam distillation unit. Here the hydrocarbons extracted from the wet gas are distilled from the rich oil. This unit consists of a conventional still operated at approximately 100 psig. The still overhead product is totally condensed and comprises the raw feed to the fractionating unit.

The fractionating unit consists of a depropanizer and a debutanizer. Additional heat is removed from the lean oil after it leaves the bottom-tray rich oil-lean oil exchanger by preheating the feed to the fractionating unit. The feed is first processed in the depropanizer where propane is produced as the overhead product with the bottoms going to the debutanizer to be split into L.P.G. or butanes and gasoline. Both of the above towers operate with total condensation of the overhead product. The fractionation unit has sufficient flexibility to produce as liquid products propane, butane, and either 26 or 14-lb. R.v.p. gasoline or propane, L.P.G., and either 26 or 14-lb. R.v.p. gasoline.

A unique feature of this process is that there are no recycle vapor streams.

Steam for the plant is furnished by three 125-hp. 300-psi. operating-pressure oil-field-type boilers. Two boilers are required for the steam load with the third serving as a

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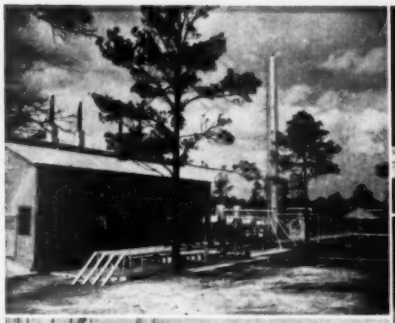
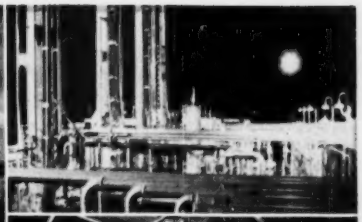
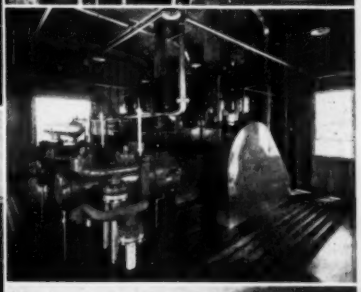
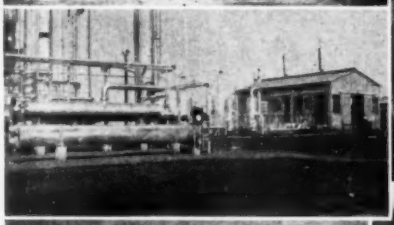
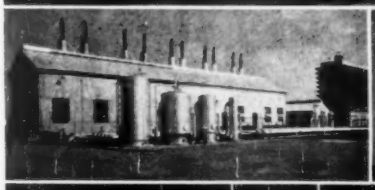
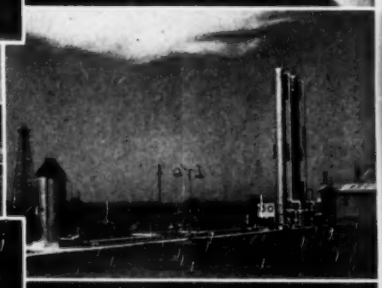
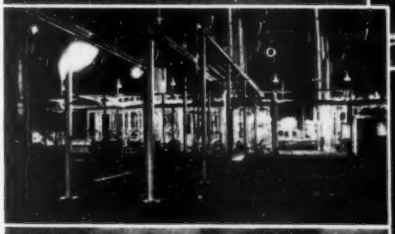
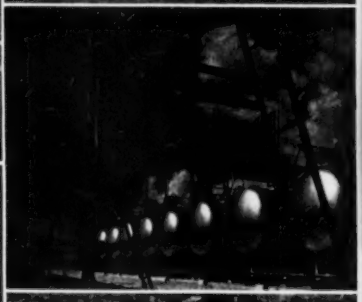
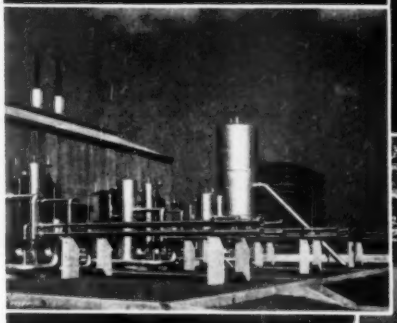

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Natural Gasoline,
Pressure Maintenance,
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Established in 1945

standby. High-pressure steam, approximately 300 psig., is used in the cooling-tower pump turbine, all reciprocating pumps, oil-reclaimer preheater, and the steam trimmer on the deethanizing absorber. The reciprocating pumps exhaust at approximately 125 psig., and this exhaust steam is used for stripping steam in the still and for heating in the reboilers. Any excess exhaust steam is condensed along with the low-pressure exhaust from the cooling-tower pump turbine.

The plant is equipped with a gas-engine-driven 25-kva. a.c. generator. The cooling tower is a natural-draft tower having 11 bays and 12 decks. Makeup water is obtained from a pond located approximately 2½ miles from the plant.

The performance guarantees made by the contractor, O. L. Olsen, in building the plant are of interest. Absorption, distillation, and fractionation facilities are capable of handling 5,500 M.c.f. of wet casing-head gas per day. When processing 2,000 M.c.f. daily, which is compressor capacity, these facilities will recover as a liquid product at least 85 per cent of the inlet propane. Fractionation facilities processing the raw product from the absorption and distillation system can make either 14 or 26-lb. R.v.p. gasoline, producing in either case liquid propane and butane products having a minimum purity of 95 mol per cent.

During a 24-hour test run, after construction, the Chalk Hills plant processed 1,814,649 cu. ft. with the following production of liquid products in gallons:

Propane	4,456
L.P.G.	5,331
Natural gasoline (14 lb.)	1,967
Total	11,754

This is an average of 6.47 gal. of liquid products per M.c.f. of wet gas. The lean-oil circulation rate during the test was 65.70 g.p.m. giving an average of 36.2 g.p.m. per million cubic feet daily of wet gas. Percentage component recoveries for the test, based on the measured rates and analysis, included propane 97.31 per cent and butane 99.27 per cent.

The calculated theoretical recoveries for the operating conditions of the test are as follows:

Propane	96.75
Butanes	100.00
Pentanes plus	100.00

The calculated theoretical recoveries for design conditions when processing 2,000 M.c.f. daily of wet gas are as follows:

Propane	90.44
Butanes	99.95
Pentanes plus	100.00

Process and engineering design, as well as construction was done by O. L. Olsen in collaboration with representatives of The Texas Co.

Unitized Shale Shaker Saves Rig-Up Time

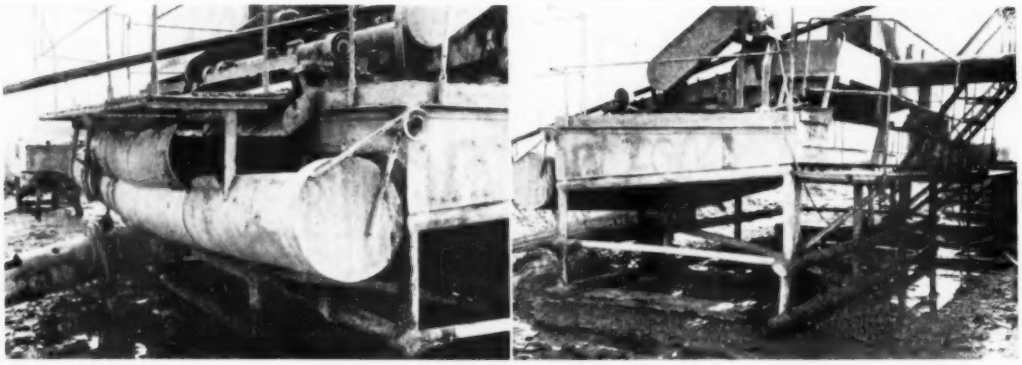
THIS report describes a unitized shale shaker unit being used by Santa Fe Drilling Co., Los Angeles. The structure that supports the twin setting of shakers and the mud receiving tank is made with 2-in. tubing skids that need rest only on cribbing or a timber mat. Ends of the skids are cut in conventional sled-runner fashion. The mud tank beneath the shaker screens is constructed with its floor sloping to the side opposite the rig, so that heavy precipitates will settle away from the mud flume carrying the circulation to the mud-pump suction pits.

A shale receiver made of 20-in. pipe is attached to the side of the unit so that cuttings will flow from the screens over an apron and be deposited in the receiver, from which they pass into a discharge pipe to the shale pit. The receiver is made by shaping two short pieces of the large pipe with ends closed, and welded to form a bowed middle near the base of the mud tank. Part of the section removed from the top side of the receiver is welded to one side as a backstop, or deflector, to prevent shale from spilling at the unit. A frame welded to the receiver holds the deflector sheet and the walkway above the receiver, to permit servicing the screens and keep them clean with safety and convenience.

The receiver is attached to the mud tank and shaker support with heavy hooks and eyebolts. The hooks are welded to a reinforcing plate attached to the mud tank, and the eyebolts welded to the side of the shale receiver. Lugs at each end of the mud tank fitted with flanges are placed in this position for stabilizing hooks which are attached to the ends of the receiver, which may be picked up for removal with the use of wrenches or a torch to cut permanent connections. Accumulated precipitates can be flushed from the mud receiver or tank by opening a large valve in the side just above the lowest point in the shale receiver, and all flushed to the shale pit with a water hose.

The catwalk support on the rig side of the shaker unit is made by setting davit-like brackets into the frame, which is folded back against the substructure when moving. Hand rails on the outside of the walks are connected to the unit with ferrules welded to the side of the tank and in the tips of the walkway brackets. Outlet of the discharge from the shale receiver is a piece of pipe containing a companion flange to which any length pipe may be attached to convey the cuttings to the shale pit. Clean mud passes from the tank through a flood gate opening into the flume, which conducts the drilling fluid to the mud-pump suction pits.

Left: Shaker aprons overhang so that cuttings will fall into receiver to be flushed into shale pit. Shale receiver attached to shaker unit with eye bolts and hooks so removal is not complicated. Right: Side of shaker unit showing davit-like supports upon which the catwalk is placed when rigging up. Walk may be removed and davits folded against side of unit for convenience when hauling.



Selection, Operations, and Maintenance Of Cooling Equipment

by M. A. Ellsworth

IN recent years the use of air as a cooling medium has increased rapidly in the oil and allied industries. If water is not available or is of poor quality, requiring expensive treatment, then the use of air as the cooling medium becomes the primary choice. The trend to air cooling was probably started by the use of radiator-type jacket-water coolers in localities where water was unavailable. Other applications followed as manufacturers improved equipment and as designers and engineers became aware of the possibilities of air cooling and began to give it due consideration when preparing design specifications.

In the event water is or can be made available, then several factors must be given careful consideration to determine whether cooling with water or air is the more feasible. In general, the initial cost of a water-cooling system is less than an air-cooled system with the air system requiring less maintenance and attention.

When preparing specifications for an air-cooled unit, the first factor to be considered is usually the temperature level at which the heat is to be exchanged. It must be remembered that operating practices generally have developed on the water-cooled basis and must be modified when air cooling is substituted. For many reasons, temperatures normally specified for water cooling may not be the temperatures that should be specified for air cooling.

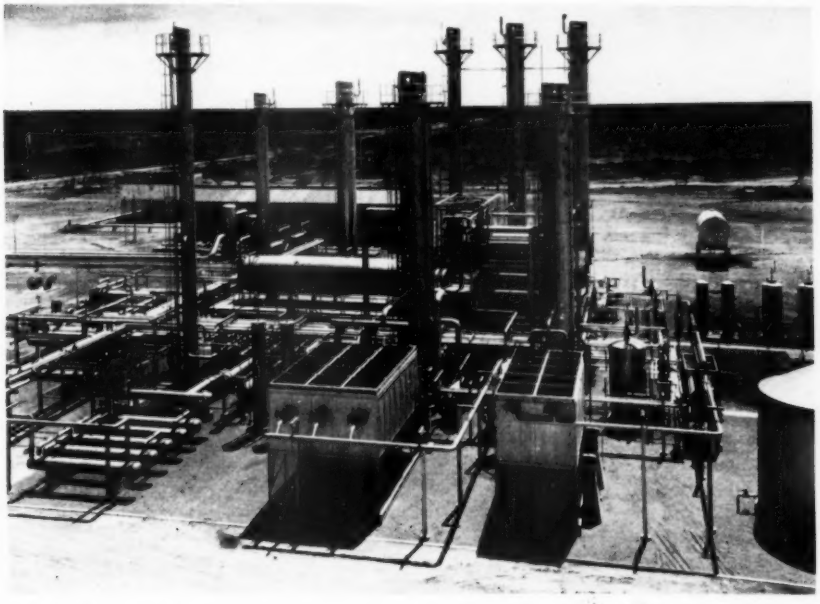
M. A. Ellsworth is district engineer at Tulsa for The Fluor Corp., Ltd. He was an engineering graduate from Oklahoma A. & M. College in 1934 and has worked with Fluor in engineering, processing and field construction activities for the last 12 years, in the Mid-Continent area.

Water can economically be cooled in cooling towers to within a few degrees of the existing wet bulb, and therefore a water temperature in the neighborhood of 80° or 90° F. is normally used in setting up design conditions. As a result, lower temperatures than actually required are often specified because higher temperatures would not appreciably decrease the cost of the cooling system.

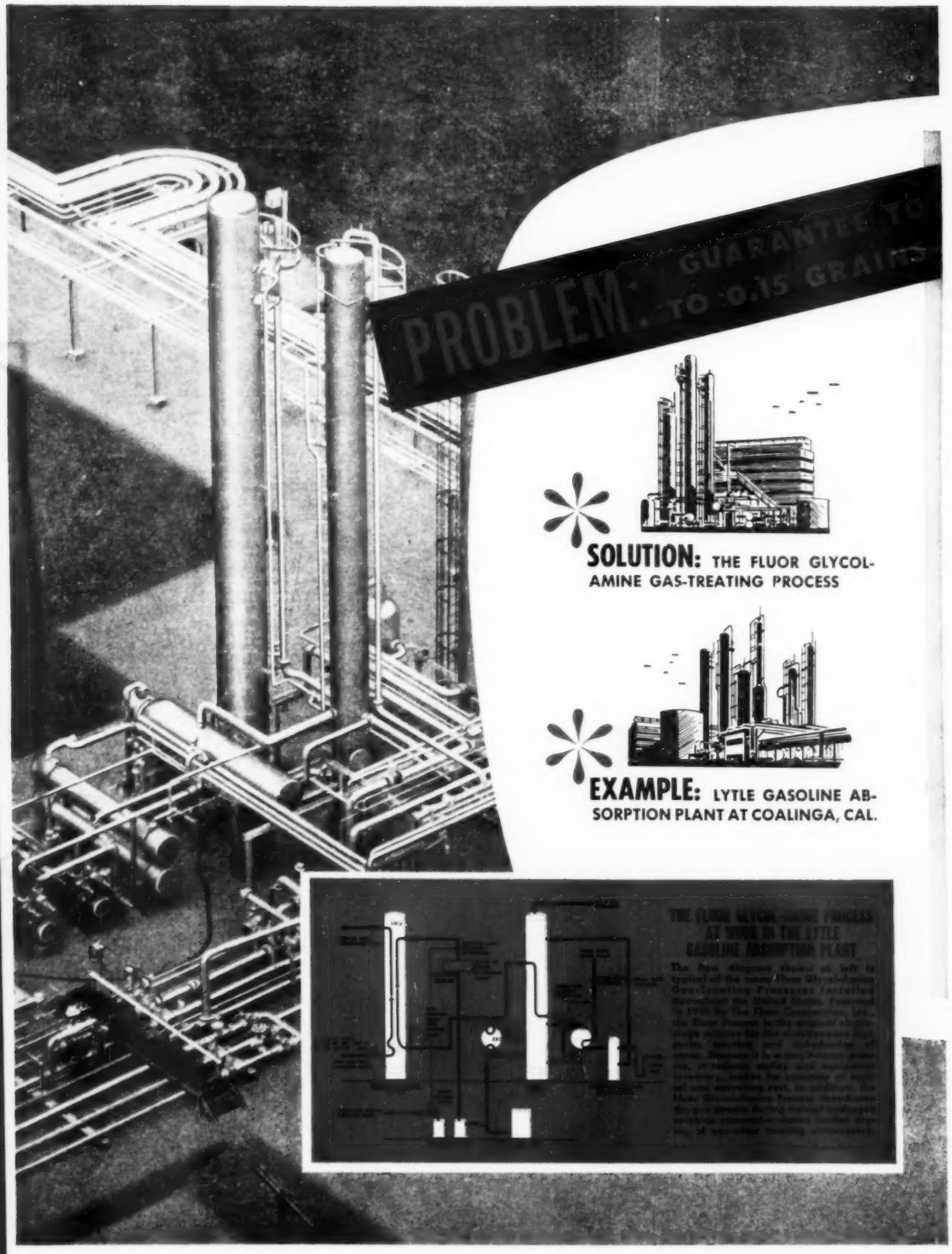
For example, the cost of a closed system consisting of a cooling tower and atmospheric coils for cooling jacket water from 140° to 130° F. with a 75° F. wet bulb is approximately $4.60 per g.p.m. circulation. This cost decreases approximately 75 cents per g.p.m. if the jacket water temperature level is increased 20° F. The power required for operating the cooling tower fans and pumping the water remains about the same. On the other hand, the cost of a finned unit for cooling jacket water from 140° to 130° F. with 100° F. ambient air is approximately $12.50 per g.p.m., and decreases to $7.75 per g.p.m. if the jacket-water temperature level is raised 20° F. There is a proportionate decrease in power requirements for operating the fans.

Roughly speaking, on a 10,000-hp. installation, this 20° F. difference in temperature level would amount to $7,500 difference in the initial cost of the water-cooled system. The difference in initial costs in the case of the air-cooled system would be $30,000 plus a difference of about 75 fan-horsepower which, evaluated at $200 per horsepower is equivalent to $15,000, making a total of $45,000.

These figures do not include any equipment or materials other than the cooling tower, atmospheric coils, and finned unit, and therefore cannot be used to make a comparison between the two systems without taking other costs into consideration.



In the foreground appear air-cooled exchangers used as overhead condensers in a recently installed southwestern area gasoline plant.


PROBLEM:
GUARANTEE TO
TO 0.15 GRAINS
SOLUTION: THE FLUOR GLYCOL-AMINE GAS-TREATING PROCESS
EXAMPLE: LYTLE GASOLINE ABSORPTION PLANT AT COALINGA, CAL.

The Lytle Gasoline Absorption Plant at Coalinga, California, is a story of the Fluor Glycol-Amine Gas-Treating Process at work.

Expansion of natural gas supply through deeper drilling introduced into the Lytle Plant a natural gas so high in hydrogen sulphide content that it was no longer acceptable as commercial sales gas. After processing for gasoline recovery, the discharge gas was analyzed and found to contain 1.25 grains of hydrogen sulphide per 100 SCF and up to three-fourths of 1 mol per cent of carbon dioxide. Even though this gas was sufficiently pure for sale in many areas, in this particular instance requirements for commercial gas were set to *not more than 0.15 grains of hydrogen sulphide per 100 SCF...* a purity requirement so stringent that it would only be attempted by Fluor Gas Processing Engineers using the Fluor Glycol-Amine Gas-Treating Process.

Following study of the requirement by Fluor, a Research Department pilot plant was set to run at gas composition and operating conditions simulating those at the Lytle Plant. Here it was *proved* the Fluor Glycol-Amine Gas-Treating Process could meet—*and exceed by a comfortable operating margin*—the 0.15 grain per 100 SCF requirement efficiently, economically, and on a guaranteed basis.

The plant for the Lytle job was then designed on the findings of the Fluor Research Department. Engineering was set in motion, and a field construction schedule formulated.

The Lytle unit is a "sweet"-running unit paralleling laboratory and pilot plant findings—meeting its guaranteed performance with an adequate margin. This new installation raises the total installed capacity of Fluor Glycol-Amine Gas-Treating Plants to 585,000,000 SCF/D.

Fluor invites owners and operators of gas-producing properties to submit their gas-treating problems for study and recommendation by Fluor's Gas Processing and Research Engineers. Let them study *your* particular problem—the range of purity obtained through use of the Fluor Glycol-Amine Gas-Treating Process is virtually unlimited. It may be the low-cost answer to your gas-treating problem.

Technical papers by Fluor research and engineering personnel are offered on the subject of gas treating—free copies are available by writing The Fluor Corporation, Ltd., Los Angeles 22, California.

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Normally, air-cooled equipment should be designed for cooling the fluid to the highest final temperature than can be tolerated for short periods, using as a basis for design the highest air temperature than can be expected during these same periods.

In the vicinity of Amarillo, a 90° F. ambient air temperature is exceeded only 5 per cent of the time during a normal year, and an 80° F temperature less than 15 per cent of the time. Therefore, equipment designed on the basis of 100° F. air will actually be operating with 80° F. air or less 85 per cent of the time.

Consideration should be given to the time of the year when the maximum duty is on the cooler. This is frequently during the winter months when low air temperatures prevail and can be used as a basis for design. This is sometimes the case when cooling gas in main-line compressor stations.

Selecting Air-Cooled Units

When selecting air-cooled units for condensers such as still overhead or reflux condensers, consideration should be given to the relationship between column operating pressure and the condensing temperature. In the past, operating pressures have been influenced by the temperature of the available cooling water. When using air for cooling, higher pressures may be in order. The increase in the cost of the vessel might be less than the saving in condenser cost.

After determining the temperatures on which design is to be based, due consideration must be given to the fact that satisfactory operation must be obtained under varying climatic conditions. A unit designed for 100° F. air may also be required to operate with air temperatures below zero.

Since varying the rate of air circulated through the cooler not only alters the mean temperature difference but has a marked effect on the heat-transfer coefficient, the performance of a cooler is dependent upon and can be controlled by varying the air circulation.

When the cooler consists of several cells, each having one or more fans, performance can be regulated by taking fans out of operation as the air temperature drops, and even though the cooler consists of only one or two cells, fairly good control can be obtained by using two-speed motors for driving the fans. However, it is often advisable to use two fans per cell, each driven by a two-speed motor. In addition to giving added control, the additional fan assembly makes it possible to take one fan out of operation for repairs or other reasons without shutting down the cooler.

In the event the fans are driven by gas engines or turbines, the fan r.p.m. can be varied to give the desired performance. This type of drive should be equipped with governors to prevent overloading the fan and gear.

In addition to regulating the air volume through the cooler, the piping can be arranged to bypass the cooler with a part of the fluid being cooled, thereby providing an additional means of control. A bypass arrangement is not feasible for condensers where it is not desirable to bypass uncondensed vapors.

In many cases, too much cooling is obtained during extremely cold weather with all fans shut off and with as much fluid being bypassed as is possible without incurring the risk of freezing the remainder going through the cooler, or of forming hydrates. In these instances it is necessary to obstruct the flow of air through the cooler caused by natural draft. Shutter devices operated either manually or by motor are available. However, many makeshift methods are being employed and it is our opinion that manufacturers of air-cooled equipment should do additional work toward developing better devices for this purpose.

When selecting an air-cooled unit, several physical and mechanical features should be examined.

Coolers are of two general types: forced-draft or induced-draft. The forced-draft has the fan under the cooling surface and forces the air up through it. The induced draft has the fan above the cooling surface and pulls the air up through it.

The induced-draft has the advantage of discharging the air above the cooler (at a relatively high velocity), thus decreasing the tendency to recycle the hot discharged air back through the cooling surface.

The forced-draft has several advantages to offset this.

1. The fan handles the air before it has been heated, and therefore handles a smaller volume requiring less power for the same performance.

2. The fan assembly can be located near ground level where it is easily accessible for servicing.

3. The motor, gear, and fan can be installed as a compact unit on concrete foundations and independent of the structure supporting the heat transfer surface.

Fans should be large enough to handle the required volume of air without excessive tip speeds. They should have adjustable-pitch blades so that major changes in operating conditions can be accommodated. For normal operating conditions, the pitch angle should be between the maximum and minimum so that it can be increased or decreased.

The plenum chamber between the fan and the cooling surface should be large enough to permit even distribution of the air over the cooling surface.

The fans can be driven by any of the usual power units: electric motors, gas engines, or turbines. Since all of these normally operate at a higher r.p.m. than all but the smaller fans, it is necessary to use reducing gears or a belt-and-pulley arrangement with the larger fans. Excellent gears are now available and are preferred. The horsepower rating of the gear should be equal to the horsepower rating of the driver, since the fan r.p.m. or the pitch angle may at some time be increased to utilize the full capacity of the driver.

As in the case with other types of heat-transfer equipment, the fluids being handled and the operating temperatures and pressures dictate the materials to be used in the fabrication of the cooling surface. The problem is somewhat simplified since air is usually clean and noncorrosive. There are exceptions, of course, such as salt spray or air contaminated with hydrogen sulfide.

Tubes are available in several sizes, and for ease of cleaning, the larger-diameter tubes should be selected when cooling fluids that are apt to scale or foul. We would place jacket water from engines that have previously been operated on an open system and lube oil in this category.

Operation

The operation of air coolers is relatively simple. We have already discussed control. However, we might add that operators should bear in mind that fan-horsepower varies as the cube of the r.p.m., whereas its capacity varies directly with the r.p.m. Therefore, theoretically, at half speed 50 per cent of the full-load air requirements is handled with 12½ per cent of the full load horespower.

Roughly speaking a jacket-water cooler designed on the basis of 100° F. air will give the desired performance with the fans at half speed when the air temperature is around 75° F. It is apparent that with two-speed motors or variable-speed drivers, the fan-horsepower can be reduced to a fraction of full load requirements during a large part of the time.

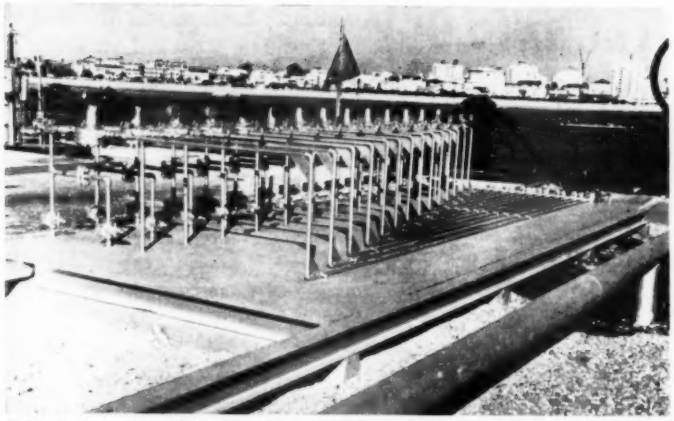
Precautions should be taken to protect the tubes from freezeups by controlling temperatures and draining the system during shutdowns, or by using antifreeze solutions.

Maintenance

Oil in the gear case should be changed periodically and other mechanical equipment lubricated as required.

The tubes should be inspected occasionally and cleaned if dirty or replaced if corroded.

If the fans have been out of operation during cold weather, any ice that has collected should be removed, otherwise the fan will be out of balance and may vibrate severely, resulting in damaged equipment. At least one manufacturer furnishes vibration cutout switches with its equipment which automatically shuts off the power if the fan assembly vibrates.



Unitized power oil manifold for hydraulic oil-well pumps, built on substantial unitized steel base. City of Long Beach in background.

Richfield Uses Unitized Manifolds *For* Hydraulic Pumping at Wilmington

UNITIZED power oil manifolds are made and being used by Richfield Oil Co. in Wilmington field, California, so as to group the controls at a central point for convenience and lease efficiency. The manifolds are designed and fabricated to handle groups of 14 wells each, any or all of which may be at some distance from the manifold itself. Building of the manifold requires substantial structural-steel I-beams for the foundation and supporting sills.

The manifold foundation is in the form of a rectangle, the principal part being approximately 10 by 16 ft. covered with stairway-tread nonslip plate as a continuous floor. The sills on each side of the manifold platform are extended another 10 ft. to provide a support for the power oil-supply headers so the entire setting may be removed intact and without rebuilding.

Two headers in the manifold connect to the pipe lines leading from the high-pressure pumps which are grouped at the separator battery and treating plant so the operators of this installation can attend to and service the engines and pumps. The two headers are placed in the frame of the manifold and become an integral part of the installation.

Vertical risers extend from each header and join a common lead line which contains the control choke and the direct reading meter. Lubricated plug valves are set into each separate line so that either of the established power oil pressure systems can be used to flow an individual well without making any change other than closing one valve and opening the other one.

Distribution lines attached to the choke valves and meters extend horizontally to the opposite side of the setting, each line becoming progressively shorter so the horizontal leads laying flat upon the floor can be arranged without overlapping of pipe. Ninety-degree welding ells are employed where the horizontal line bends downward, and where the riser is attached to the horizontal lead on the floor. These ells are reinforced with gusset plates welded into the turn so as to stabilize the setting and prevent damaging vibration.

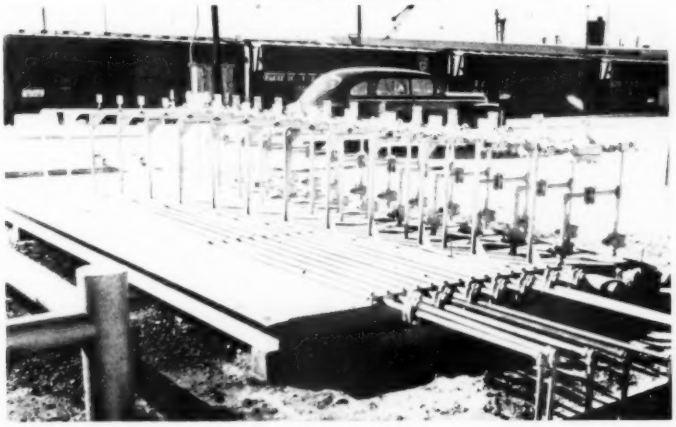
Lines on the floor are tied down with individual bolted saddles near the turn, and with a continuous piece of channel iron with bolts at each end and between adjacent lead lines. The end of each lead line, after passing across the floor, is fitted with a companion bolted ground joint union so that any line can easily be disconnected without disturbing its neighbor. The unions are attached in a staggered position; that is, one line has the union nearer the floor than the next so wrenches may be used easily to disconnect or make up a connection.

Card holders for well numbers.— These are attached to the horizontal pipes down stream from the meters to avoid confusion when making any adjustment in the flow or changing from one power oil pressure to another. The holders are made of light sheet metal to contain a standard 5 by 7-in. card, and are attached to the line by welding a short nipple of pipe to the line and using a set screw which retains the holder stem solidly in place.

Indicating pressure gages are set into reducing ells between the well number card holder and the direct reading meter, all within easy reading distance of the pumper as he stands at the choke control valve. The entire unit is mounted on concrete piers so as to maintain its original level position.

Removal of the unit from the location is accomplished by breaking out the supply-line bolted unions and disconnecting the connections on the down stream end of the individual lead lines. It then can be placed on a flat bed and transported to any new location desired without making any change in the design or piping arrangement.

Opposite end of same manifold showing method of holding down lead lines and use of bolted unions for connections.



QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Paraffinic Oils

We see your question of March 9, 1950, in which you show the relation of factors to the properties of products. Can you direct us to lists of the characterization factors of common crude oils, particularly Oklahoma City field?—R. S. P.

There are so many crude oils that three issues will be required to tabulate the characterization factors of the major crude oils. No comprehensive lists appear in the literature. Tabulations of naphthenic and intermediate crude oils will appear in succeeding issues.

References

1. Taken from Bureau of Mines Hempel distillations, Repts. Invest., 4289, etc.
2. Up to a boiling point of 392° F.
3. First value for distillate-like material (504° F. boiling point) and the second for lube materials (756° F. boiling point).
4. See Questions on Technology, March 9, 1950, and March 23, 1950.

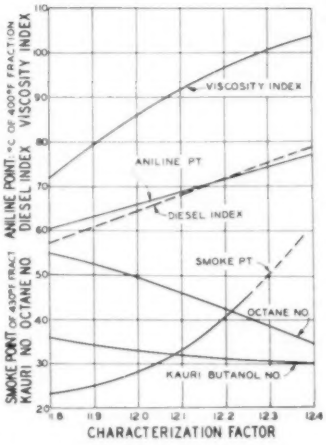


Fig. 1 — Approximate properties of stocks from paraffinic crude oils.[1]

PARAFFINIC CRUDE OILS OF THE UNITED STATES[1]

Field and state—	A.P.I. gravity	Sulfur (per cent)	Gasoline and naphtha[2] (per cent)	Characterization factor[3]
Paraffin base:				
Atlanta, Arkansas	44.5	0.48	37.0	12.07 & 12.28
Dorcheat-Macedonia, Arkansas	69.8	<0.10	83.2	12.52 &
Caddo (Light), Louisiana	40.6	0.21	31.1	12.20 & 12.30
Cotton Valley, Louisiana	40.6	<0.10	19.1	12.15 & 12.56
Cotton Valley (condensate), Louisiana	65.6	<0.10	80.6	12.32 &
Eola, Louisiana	44.1	<0.10	34.9	12.02 & 12.24
Erath, Louisiana	52.0	<0.10	55.4	11.98 & 12.26
Haynesville, Louisiana	34.8	0.53	14.3	12.36 & 12.39
Rodessa, Louisiana-Texas-Arkansas	39.8	0.30	22.8	12.20 & 12.35
Coldwater, Michigan	49.7	0.30	41.1	12.30 & 12.28
Fork, Michigan	50.1	0.32	42.9	12.24 & 12.20
Bradford, Pennsylvania	43.6	0.11	34.4	12.09 & 12.26
Big Lake, Texas	46.3	0.18	41.0	12.13 & 12.31
Cayuga, Texas	58.7		81.0	12.18 &
New Hope, Texas	49.0	0.41	44.4	12.16 & 12.22
Panhandle, Texas	42.8	0.38	37.3	11.97 & 12.36
Lance Creek, Wyoming	43.2	<0.10	36.2	12.08 & 12.22
Paraffin intermediate:				
Chase, Kansas	48.1	0.26	48.0	12.02 & 11.92
Golden Meadow, Louisiana	37.8	<0.10	19.9	12.02 & 12.15
Lafitte, Louisiana	36.6	0.14	19.2	12.00 & 12.10
Neale, Louisiana	38.4	0.14	27.7	12.03 & 12.02
Ville Platte, Louisiana	10.4	0.11	28.8	11.97 & 12.07
Adams, Michigan	33.2	0.66	22.7	12.08 & 11.48
Deep River, Michigan	34.2	0.60	25.4	12.09 & 11.82
Reed City, Michigan	46.3	0.54	41.0	12.09 & 11.92
Cranfield, Mississippi	40.9	0.10	34.7	11.98 & 12.12
Pickens, Mississippi	40.4	0.72	30.2	12.06 & 11.92
Tinsley, Mississippi	34.6	0.77	25.7	11.98 & 11.96
Allegany, New York	41.5	0.17	31.2	12.04 & 12.15
Apache, Oklahoma	38.8	0.38	31.3	11.98 & 11.91
Fitts, Oklahoma	39.0	0.18	26.7	12.06 & 12.15
Moore, West, Oklahoma	48.1	0.12	46.9	11.97 & 12.07
Pauls Valley, Oklahoma	41.9	0.17	34.6	11.97 & 12.08
St. Louis district, Oklahoma	43.8	<0.10	36.9	12.00 & 12.11
Darst Creek, Texas	36.8	0.83	23.6	12.03 & 12.11
Long Lake, Texas	43.4	0.11	45.7	12.00 & 12.14
Sulphur Bluff, Texas	24.5	2.95	16.2	11.97 & 11.74
T.X.L., Texas	40.9	0.19	31.0	12.22 & 11.96
Van (Deep), Texas	32.8	1.02	23.8	11.98 & 11.78
Intermediate paraffin:				
Bosco, Louisiana	36.6	<0.10	12.8	11.80 & 12.20
Gibson, Louisiana	37.4	<0.10	12.1	11.88 & 12.30
Nebo-Hemphill, Louisiana	43.2	<0.10	38.2	11.96 & 12.18

Small Exchangers Used on Engines; Cost is Low

Your comments of February 23, 1950, entitled, "Small Exchanger Costs" are strange inasmuch as we have constructed over 200,000 small units and our costs are much lower than you indicate. Perhaps R.F.P. and other readers will appreciate hearing more about the cost of small exchangers. D.S.M.

The exchanger costs shown on the Questions on Technology page of February 23 are much higher than those of Ross Heater & Manufacturing Co., even though the Ross exchangers are constructed of somewhat expensive copper and copper-base alloys rather than steel and cast iron. Approximate cost (1950) and average per square-foot costs are indicated in Table 1.

Although small exchangers are generally more expensive than large exchangers when compared on a square-foot basis, it is evident that small exchangers that are manufactured on an assembly line basis can be cheaper than larger exchangers that are produced on a somewhat "tailor-made" basis. **The cost of small exchangers may be lowered greatly** by (1) standardization upon a few standard designs, (2) improvements in brass forging practice so that machining is largely eliminated, (3) the use of fixed tube sheet exchangers, made possible by the use of similar kinds of metal for the tubes and for the shell so that expansion difficulties are alleviated, (4) tube layouts which allow the shell to be more completely filled with tubes, and (5) most important of all, assembly-line mass-scale production. Several of the above features can be more easily accomplished with small exchangers than with larger sizes (100 sq. ft. and up). How successful such efforts can be are indicated by the very low costs indicated in Table 1.

TABLE 1—APPROXIMATE AVERAGE COSTS (1950) OF MASS PRODUCED SMALL EXCHANGERS
(Dollars per sq. ft.)

	Copper alloy construction		
Area, sq. ft	Standard*	High pressure†	All stainless†
1.5	$19.00	$23.00	
2.0	17.00	20.40	$39.00
5.0	12.50	14.70	28.50
10.0	10.00	11.80	22.00
20.0	8.00	9.50	17.00
50.0	5.80	6.80	12.80
100.0	4.20	5.10	10.40

*Pressure of 75 psig. on tubes and on shell. †225 psig. on shell, 150 psig. on tubes.

Although some small exchangers are used in laboratories, for pilot plants, and for small commercial process units, the uses that permit mass production are related to engines, hydraulic presses, etc. Thus, enormous numbers of small exchangers have been extensively used in conjunction with diesel engines, gas and gasoline

engines, turbines, compressors, reduction gears, thrust bearings, hydraulic presses, hydraulic couplings, die-casting machines, machine tools, torque converters, pumps, molding machines of the injection type for plastics, quenching oil, cutting oil, transformers, and forced-draft blowers. Although many large exchangers are used in large-scale commercial processing plants, such as petroleum refineries, it is probable that the number of units so employed is smaller than the number of small exchangers used for the services enumerated above. Ross Heater & Manufacturing Co. has been active in developing a line of small exchangers which are produced on a mass scale.

More Wells—More Oil?

(Continued from page 220)

duction of 150 bbl. per day. Subsequent drilling led to juncture of Wewoka Lake pool with the old Jackson pool with the situation ultimately developing into that reflected by Fig. 23. On this latter figure are contours of initial well potentials reflecting the fact that the old Jackson pool was a part of a much larger source of supply, and that the wells of highest potential were in that area.

Pool is located on a 2-mile-long north-plunging nose and has about

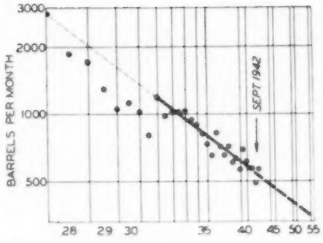


Fig. 19—Production history of discovery well for West Agra.

50 ft. of structural relief for which reason the structural feature is of little significance in establishing production histories.

Initial potential of wells in the old Jackson area to the south ranged from 5 to 256 bbl. per day and averaged about 75 bbl. per day. The 12 wells first drilled in the old Jackson pool had accumulated production of 667,000 bbl. to January 1, 1950, and the 6 wells which remain unplugged produce 16 bbl. per day.

In the Wewoka Lake area of the pool, development was on a 40-acre basis through 1945. After wartime drilling restrictions were removed, nine wells were in-fill drilled on 20 acres in area "A." In 1946-47 drilling extended southward and the Wewoka Lake area was joined with Jackson

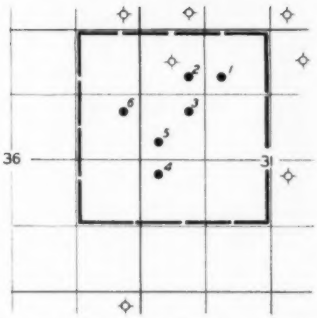


Fig. 20—West Agra, additional wells drilled.

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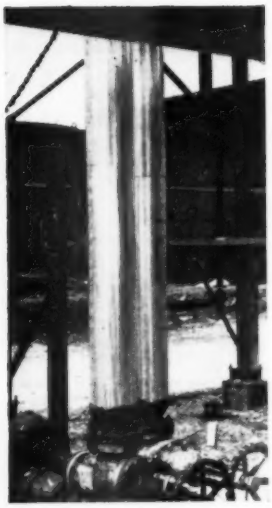

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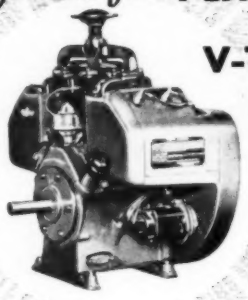

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pool, which by this time was developed on a 10-acre pattern.

Production history of area "A" covering the initial development of nine wells on 40 acres, the in-fill drilling on 20 acres to bring the total wells to 18, is represented in Fig. 24. If the decline curve of the original nine wells on 40 acres were extrapolated to 900 bbl. per month the indicated ultimate recovery would be 976,000 bbl. The indicated ultimate recovery to the same point of production for 18 wells in area "A" is 718,000 bbl.

Here again, more wells did not mean more oil production from an area of the pool. This without much question was primarily due to the fact that the development outside of area "A" was in a higher potential, more densely drilled area in the same common source of supply, which resulted in drainage away from area "A" in spite of the additional drilling. Were one to make an effort to state that the recovery was higher in the Jackson area simply due to the center spacing, without recognizing the drainage from area "A," an error in conclusion in respect to the effect of spacing on ultimate recovery from the pool would result.

Significance of interference

To pursue the question and inquire of the further evidence that the ultimate recovery from Wewoka Lake pool, or any other, is substantially independent of the well density would require a length of analysis beyond the confines of this paper. The production history of separate leases and an analysis of the production obtained from each well in terms of the time of completion would provide additional facts. It is deemed sufficient here to have shown that wells create "interference" and that on the basis of the existence of interference, drainage by any well is from the common pool and not alone from the separate lease or drilling unit.

Interference exists even between remote and distant parts of a common source of supply. Detailed studies of the individual pools here considered, or of others that have come to attention, have shown no evidence that would lead to a conclusion that the recovery from any pool was ultimately greater simply because the pool was drilled finally on 20-acre spacing rather than 40, or on 10 rather than 20 acres.

If the production data of Wewoka Lake pool had not been analyzed in enough detail to show the existence of interference between wells and leases, a conclusion that the advocates of close well spacing like to reach might have been the end point of the analysis. It is a fact that the wells in the Jackson area of the pool drilled on 10-acre spacing obtained an ultimate production **per acre of spacing unit** greater than the ultimate production per acre of spacing unit in the more widely spaced parts of the pool. The wells were unprorated and the more densely drilled area was also the area of higher potential. It is not startling, therefore, to find that the per acre

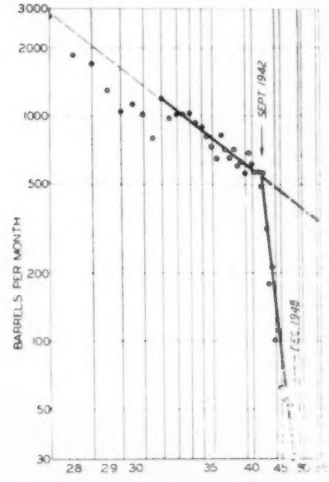

Fig. 21—Production history of No. 1 well, showing decline after additional drilling.

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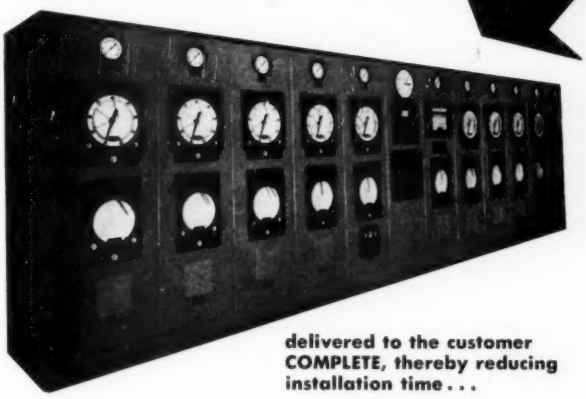

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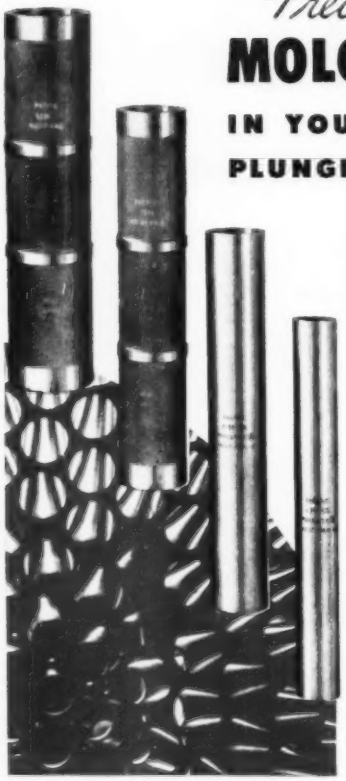

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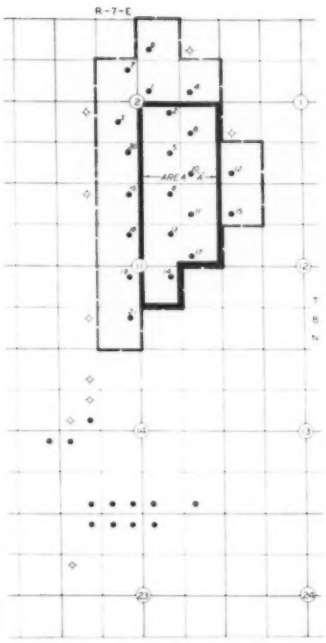

Fig. 22—Twelve wells originally comprised the Jackson pool in Sections 14 and 23. The development northward is in the Wewoka Lake pool area.

production attributed to the closely spaced wells was on the average greater than the per acre production in the other parts of the common source of supply.

The existence of interference between wells and leases establishing drainage by all wells from the entire common source of supply amply accounts for the difference in well production due to difference in well density. To not recognize interference and drainage, and to go blindly forward alleging that the recovery (as distinguished from production) was greater in the area of dense drilling due to well density alone, is to commit a serious error. To go beyond all reason and allege that the production from the close-spaced wells due to their capacity to capture from the common source of supply is evidence that 10-acre spacing would have produced a greater ultimate recovery from the common source of supply than would 20-acre spacing would be to compound the error.

Cutler's Rule

There is no discovery of new fact in recognizing that the more densely drilled leases or area of a pool capture the relatively greater share of a common source of supply under circumstances of unprorated operation or under conditions where the allocation formula is essentially on a per well basis. That fact was first

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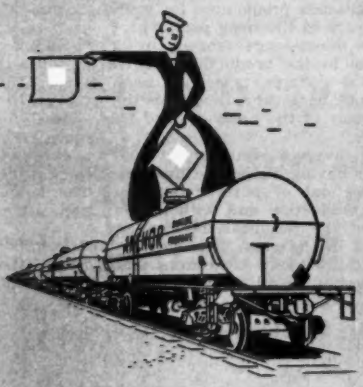

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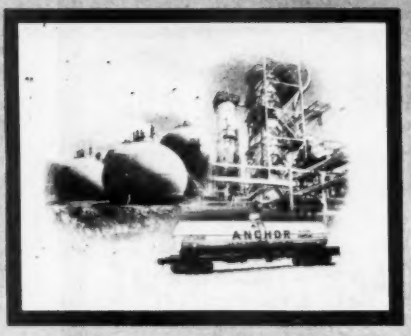

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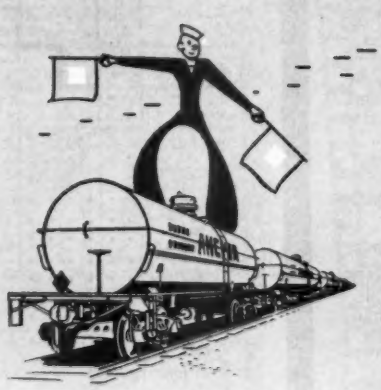
PRODUCTS



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established by W. W. Cutler, Jr.,[2] who announced a tentative rule in the year 1924 as follows:

"The ultimate productions for wells of equal size in the same pool, where there is interference (shown by a difference in the production decline curves for different spacing), seem approximately to vary directly as the square roots of the areas drained by the wells."

Cutler deserves some credit and honor for having discovered this rule of capture out of purely statistical data on production and without the benefit of the technical information developed in the years following. In 1924 there were only suggestions that the production of oil depended upon the existence of gas drive or water drive, or that gas production, reservoir pressure, and other reservoir factors were important in determining production and recovery.

Unfortunately, there are some who would rather turn Cutler's rule away from the area of its validity and seek to interpret it in terms of percentage ultimate recovery of oil in place in pools or seek to use it as a measure of ultimate recovery from separate leases or from spacing units. The language of the rule prohibits such attempts at distortion of fact.

Language of Cutler's Rule

An attempt to interpret Cutler's rule should be made only against the background of the author's comment in his original publication.[2] Nevertheless, Cutler succeeded in the statement of the rule itself to include conditions and premises that should stand as a warning to those who seek to use his rule to prove that "more wells produce more oil." The author of the rule never made a statement that would support such an inference if it were applied to the production from the entire source of supply. It is obvious that Cutler never intended to compare the recovery in one pool with the recovery in another pool on the basis of different well densities. Yet many after him were blind to that injunction and seek to use his rule in a seriously erroneous fashion.[3,4]

Cutler stated his rule applied to "ultimate production from wells." Therefore, he did not contemplate its application as a measure of recovery of oil initially in place in pools or beneath separate leases. The qualifying phrases: "The same pool;" "where there is interference;" and "of equal size" were obviously made a part of the rule of Cutler's understanding that under circumstances of unrestricted production wells were simply "straws in a glass" and must

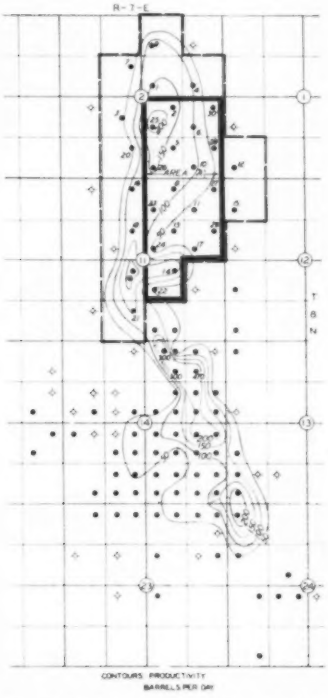

Fig. 23—Jackson pool and Wewoka Lake eventually join. Former was drilled on 10-acre spacing; later had in-fill drilling which reduced spacing from 40 acres per well to 20 acres per well. Jackson pool wells had highest productivities.

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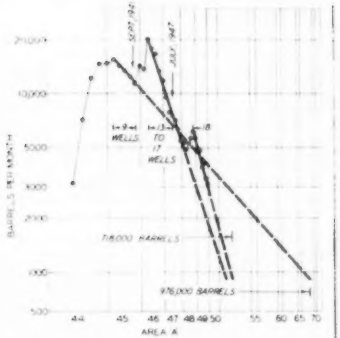

Fig. 24—Production history of Area A, Wewoka Lake. The original nine 40-acre wells had indicated ultimate recovery of 976,000 bbl. After in-fill drilling to 20-acre spacing plus 10-acre drilling in Jackson area to the south, the indicated ultimate recovery for the final 18 total wells in Area A dropped to 718,000 bbl.

be recognized as such. The first qualifying phrase warned that the production per well could not be compared as between separate and distinct pools for reasons now well known.

The second qualifying phrase controls the application of the entire rule and directs that it can be applied only under conditions where wells drain from the entire common source of supply as evidenced by the existence of interference, which qualifying phrase renders Cutler's rule useful only to measure the relative quantities of oil **captured** by open and unrestricted competition for production.

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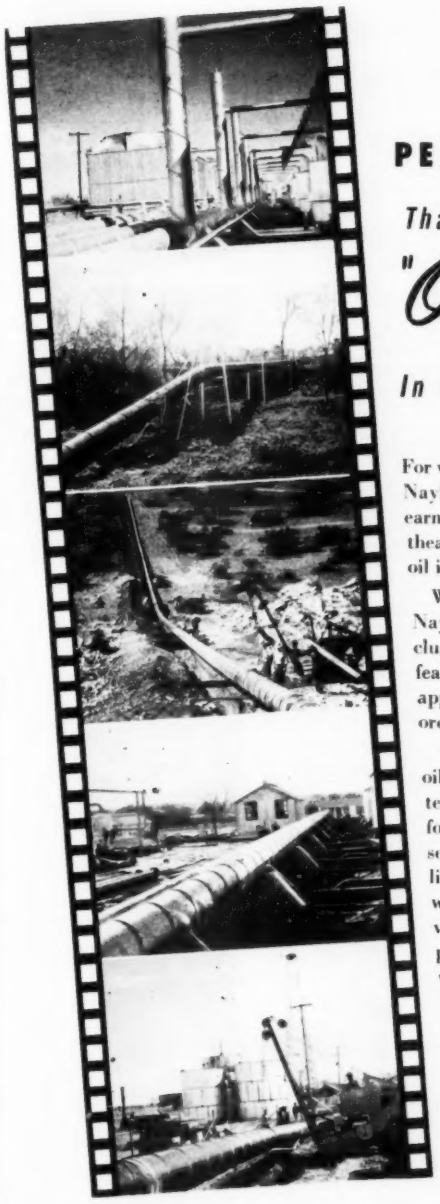

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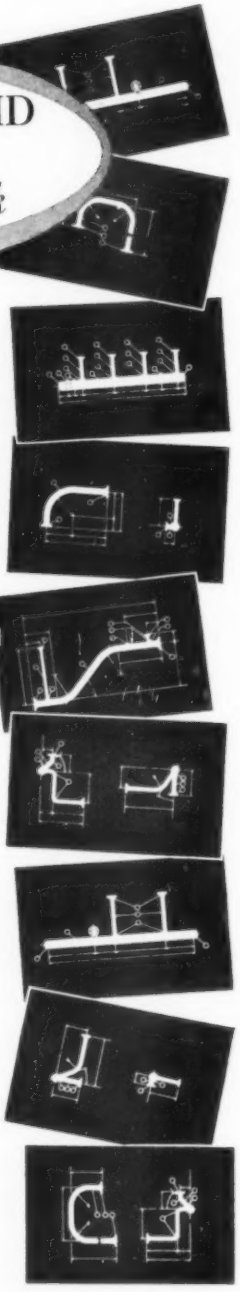

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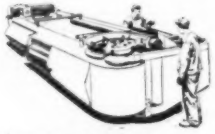

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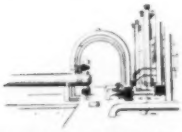

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(Continued from page 169)

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With these more modern plants, operation becomes especially practical and economical when the reboiling scheme employed in these two plants is used. These demethanizer units do not include any reboiler, or heat exchanger used for a reboiler, nor do they use an inert stripping medium such as steam or an outside gas supply. The rich oil from the base of the demethanizer unit is pumped through the higher-temperature sections of the regular plant exchangers and through the oil-heater furnace to the high-pressure still.

Recycled vapor.—A portion of the flash vapors released from the rich-oil stream at the furnace outlet is recycled to the base of the demethanizer unit as a heating medium. These vapors go further than merely supplying heat since they are in direct contact with the rich oil on the lower stripping trays. These vapors do not include any undesirable light hydrocarbons that must pass on through the demethanizer stripping section and load the absorption section. Heat is obtained primarily by the condensation of these hot vapors on the lower stripping trays. The vapors contain portions of all the hydrocarbons existing in the stabilized rich absorption oil, even vaporized oil. These vapors are, however, much more volatile than the rich-oil stream.

When condensed on the stripping trays and added to the net bottom product of the demethanizer the result is a demethanizer base product that will boil at a relatively low temperature even though not containing methane or any appreciable quantity of ethane. In the plants mentioned above the demethanizer base temperature runs about 250° F. This temperature is controlled with an instrument and motor valve throttling the heating vapors admitted to the tower base.

The above system accomplishes the required rich-oil stabilization without an expensive demethanizer reboiler, and works into a heat exchanger system that is efficient without the installation of excessive heat exchanger surface. The oil-heater furnace serves not only as a preheater for the distillation unit but a direct reboiler for the demethanizer unit.

CASE HISTORY

How Du Pont Service Solved a Tetraethyl Lead Storage and Handling Problem

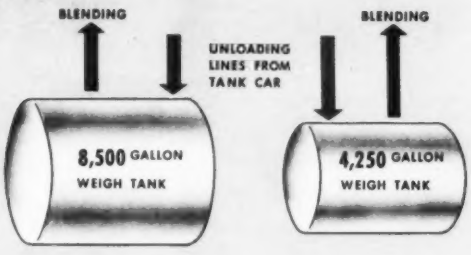
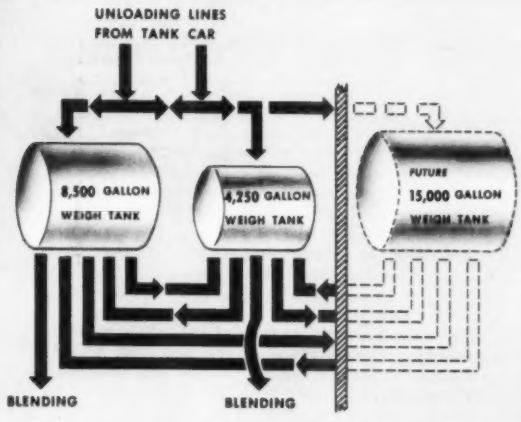


Diagram showing original set-up of TEL weigh tanks in large refinery. Operation of blending plant was inflexible because each tank could only be used individually.



Blending plant diagram after redesign by Du Pont TEL operating division. Complete flexibility was obtained as well as provision for future expansion when desired.

A large refinery was using two tetraethyl lead weigh tanks which had been installed at different times as the plant increased in size. Because each tank had been set up as a separate unit when put in, blending operations were not as flexible as desired.

As demands on the blending equipment increased the refiner sought some method of improving the flexibility of his present TEL blending plant and at the same time provide for the addition of expanded storage and weigh tank facilities.

The Du Pont field representative was called in for his recommendation. After careful analysis of the problem, he made a proposal which:

1. Gave maximum flexibility and economy through modernization of present installation. Provision was made to use existing fittings and other parts wherever possible to keep cost at a minimum.

2. Also provided for future installation of additional weigh tank to handle long range growth. Design enabled new facilities to be hooked into present ones when built, but did not require that money be spent for new storage until needed.

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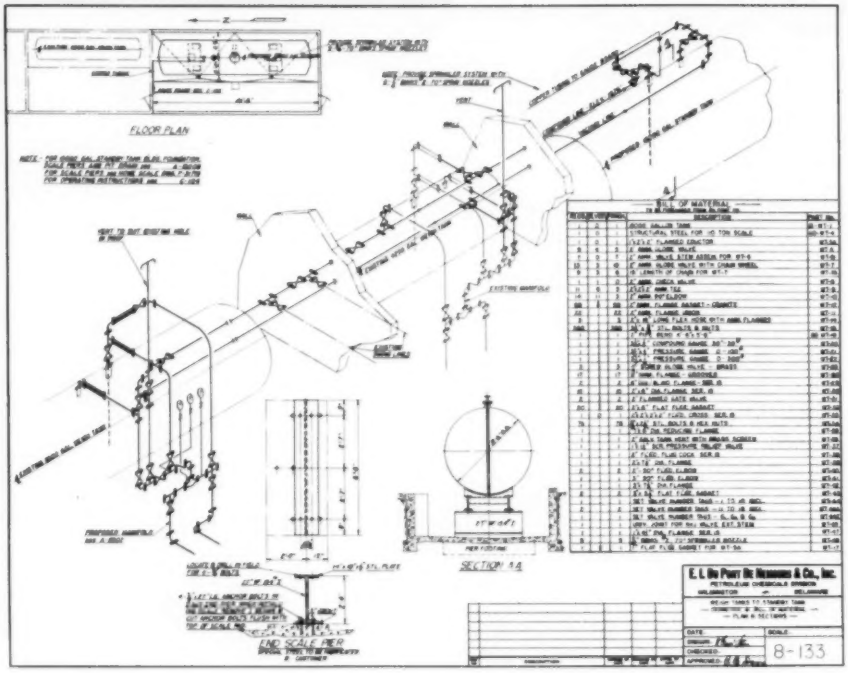

Du Pont provides complete design service for all TEL handling problems. Valves, fittings and other special parts for blending plant construction, repair and modernization may also be obtained from Du Pont.

Du Pont Services Provide Safe, Practical, Economical Solutions to Your Problems

DID YOU KNOW

Du Pont developed "Nitramon" S, a blasting agent for seismic exploration? These special blasting agents which go under the trade names "Nitramon" S and "Nitramon" WW cannot be detonated even with a rifle bullet. They require a special primer. Blasting agents and explosives are only a few of the many Du Pont products used throughout the oil industry from oil location to finished product.

This case history, where the Du Pont field representative was able materially to improve the flexibility of an existing installation, and provide for future expansion is but another example of Du Pont TEL services in action.

Whenever you have a problem involving TEL handling, blending or storage, call your Du Pont Petroleum Chemicals Representative. His recommendation, based on experience in handling a wide variety of such problems, will offer a safe, practical and economical solution.

This is only one of the many services Du Pont provides in connection with its tetraethyl lead compounds. Others are: Safety, Technical, Research, Medical, Marketing and Field Laboratory.

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- METAL DEACTIVATOR—DYES

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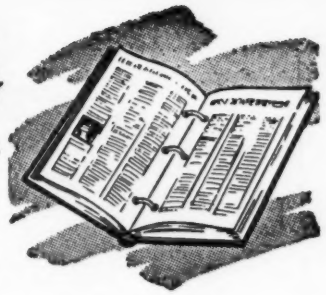
A-429

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL



Economics of Automatic Control*

HOW far is it economically sound to refine a control system? This question can be answered completely, of course, only when full and specific details of a given application are known, but some general commentary is in order.

How complex a control system?—Heater-control systems aren't so complicated today as they were a few years ago. There was a time when derivative action in a controller on heater outlet temperature service could be justified. That need was due principally to weaknesses in the instruments themselves. Fortunately today, improved thermocouple designs and the use of electronic balancing in potentiometers have greatly decreased the lags which were present in measuring systems. Thus, more complex controller actions are no longer required to overcome measurement weaknesses. There are several entire refineries today where one will find absolutely no use of derivative action in controllers.

Some refineries have improved their heater-control systems by using electric-type flow meters on the charge stock and fuel lines. The close coupling of meters of this type with the orifice eliminates the need for seals and increases speed of response. In addition, such meters can be steam traced at much higher temperatures to permit the handling of viscous fuels. The volumetric displacement of the electric-type meter is much less, also contributing to faster response.

A refinement in instrumentation often used where atomizing-type burners are used on oil-fired heaters is the proportioning of steam flow to oil flow. This can be accomplished by employing a regulating valve to maintain a definite differential between oil and steam pressure. The principal benefit to be gained from this arrangement is steam economy, which if calculated over the period of a month can be appreciable.

No heater can be considered completely instrumented without the recording of several metal tube temperatures, bridgewall, and combustion-zone temperatures. These points normally are recorded on a multipoint instrument. With the close personal attention of a trained fireman, why record such temperatures automatically?

One reason, of course, is that it is not uncommon today for one fireman to take care of three heaters. And, too, even a well-trained eye cannot be compared with a thermocouple when it comes to measuring temperature. Thermocouples spotted on the tubes are quick to sense the hot tube, due either to coking or improper flame conditions in the heater. They are and have been responsible for keeping many a heater on stream, whereas if such observations were left entirely to a fireman, the chances for developing real difficulties would be much greater.

Instrumentation trends.—Much greater emphasis is now being given to proper heater instrumentation than ever before. For years, it appears that the fractionating tower received the greatest amount of attention, not only on the part of the contracting engineers and the instrument manufacturers, but also by the refiners themselves. The need for better and closer control on heaters has become more apparent as their design, with less heating space but greater velocities, has evolved.

Closely associated with heater instrumentation is combustion control and efficiency. Can you name an industry which consumes as much fuel as the petroleum industry and yet which, over-all, has paid less attention to combustion efficiency? Some interest has been shown in this subject during the past few years and this definitely can be counted as another trend. As the industry becomes more and more fuel conscious, undoubtedly more research into this application will be conducted.

Instruments and labor.—One large refinery installed a deethanizer unit further to process one of the streams from an adjacent poly plant. The new deethanizer unit was put up about 30 ft. from the poly plant and about 60 ft. from a large fluid cat unit. The distances involved were just enough to make it inconvenient for the operators of either the poly plant or the fluid cat unit also to keep close watch on the deethanizer. Originally, it was planned to install a panel with approximately 10 instruments at the base of the deethanizer. Upon further study, however, it was decided to locally mount pneumatic transmitters on the deethanizer unit and place the instrument panel board for this unit in the control house of the poly plant. In this manner the operators of the poly plant could easily absorb the additional supervision of the deethanizer. Were it required for these operators to travel to an instrument board at the deethanizer unit proper, however, chances are that an additional operator would have been demanded, in that the philosophy at this particular refinery is that a minimum of one operator must go with each panel board of appreciable size.

The extra investment in pneumatic transmitting and receiving equipment was a little over a thousand dollars. To operate the deethanizer unit, one man per shift, it was estimated that the total cost per year would be $20,000. This figure, of course, included wages for one man per shift, plus necessary funds for workmen's compensation, hospitalization, retirement plan, etc.

In this particular refinery, labor is paid close to $3 per hour. When requesting a quotation for instrumentation, figures were asked on the instruments alone and also for a completely prewired and prepipe instrument panel, packaged for ready installation upon receipt at the refinery.

Their calculations indicated that a packaged panel was slightly more economical and, since this is a moderate-size refinery, it was felt that a much neater and more workmanlike job could be done by the instrument manufacturer than by local labor. The use of such packaged panels is another trend today. In this case the petroleum industry is following rather than leading. In the paper and textile industries during recent years, for example, these prefabricated panels have been very popular, but they are just beginning to take hold in the refineries.

*Portion of paper "Petroleum-Refinery Instrumentation," by D. M. Considine, Minneapolis-Honeywell Regulator Co., presented at the thirty-eighth annual meeting of the Western Petroleum Refiners Association, San Antonio.

No. 16 in current series. The Refiner's Notebook has been published continuously since 1944.

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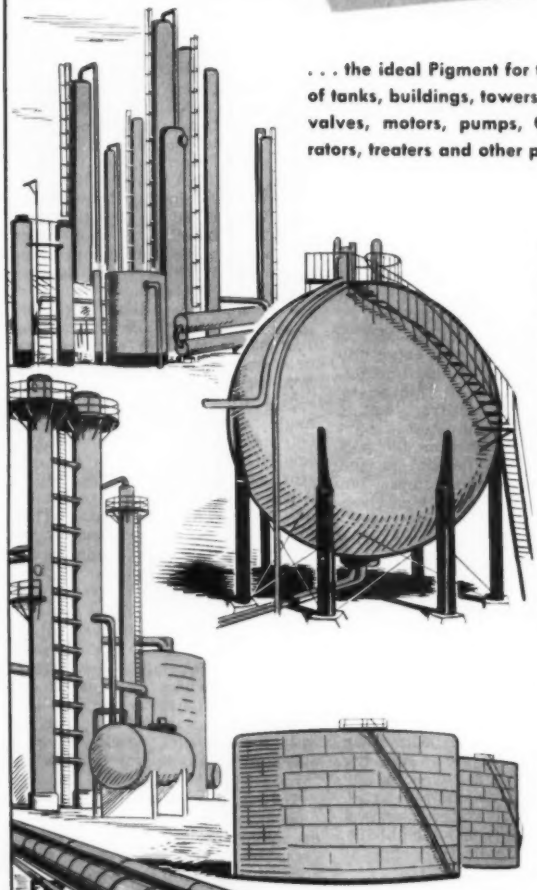

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ENGINEERING fundamentals

Coring and Sampling

ONE of the methods of obtaining basic reservoir data is to sample the reservoir directly. This is done particularly to enumerate the physical properties of the reservoir rock and the nature of the fluid content.

Determination of reservoir data by coring involves three steps. The first is to obtain the sample. The second is to test the sample for the required information. The third is to employ sufficient samples accurately to delineate the reservoir properties and their variations. Testing the sample once it has been acquired is usually a straightforward laboratory problem.

Any good sampling technique requires a knowledge of the system being sampled and the reasons for which one desires the sample. This applies to the coring of reservoirs to obtain samples for permeability, porosity, or fluid-content determinations. For example, if a reservoir rock were made up of uniformly sized, uniformly packed spheres, a sample large enough to show the packing and the grain size would suffice. On the other hand if the reservoir were made up of randomly sized, randomly packed spheres a sample would have to be large enough to include a representative number of sphere sizes and sphere arrangements.

A reservoir may be so constructed that cores of ordinary size are not large enough to include a representative amount of the rock material. This is particularly true of reservoirs where there are fractures or large solution openings that make up the major permeability character of the reservoir. It is possible that in such a reservoir there is no representative sample any smaller than the entire reservoir itself. Although cores may be obtained in a fractured reservoir, these are generally of the rock between the fractures. These rock specimens may show consistency of properties but they cannot be considered proper reservoir samples. They are representative only of the rock and not of the rock-fracture system. To obtain a sample of the latter would necessitate including a representative number of fractures.

In general, it can be said that if a sample is attempted in a region where physical properties are discontinuous, the sample must be large enough to include a representative member of discontinuities of the physical property to be good sample of the system as a whole.

To state, therefore, whether coring is a valid procedure for sampling a reservoir presumes a knowledge of the character of the reservoir, and whether one desires merely a sample of the rock matrix or of the fluid-containing system. This, of course, is one of the proposed end results of coring. It is necessary therefore to employ indirect evidences or empirical knowledge to determine whether a sample is properly taken.

Indirect evidences which can be employed to guide in determining whether a core will give a proper sample are (1) a knowledge of the type formation, (2) a knowledge of the type of porosity, (3) a knowledge of the manner in which the reservoir trap was formed, (4) the percentage of core recovery, and (5) comparison with other log data such as drilling time, caliper logs, electric logs, or radioactive logs.

Even after it has been decided that a coring technique is useful, one must obtain samples at random in order to describe the variation of reservoir properties. Another way of stating this is that the reservoir samples must be taken without any prejudice, either operational or personal, before they can be analyzed to show an accurate variation of reservoir properties.

In those instances where a "soft" formation is cored the procedure of coring may destroy the sample. This is an instance of operational technique which does not permit a random sampling. Any action of the coring process which destroys a portion of the core or makes it useless for testing can be so regarded.

When the core is brought to the surface for examination, samples on which tests are to be made must be chosen. These samples may also be chosen so that randomness does not hold. For example, the choice of the direction in which the test samples are drilled from the core may constitute prejudice. Provided the reservoir is homogeneous in all directions, the direction of drilling a sample plug would be of no consequence when making a permeability determination. It is usual, however, to have nonhomogeneity of permeability and therefore a choice of a given direction for sample plugs would not give random samples unless there would be a randomness to the horizontal distribution of permeability within the reservoir being cored. Samples drilled in a given direction may of course be random for differentiating between vertical and horizontal permeability but not for changes in horizontal permeability.

It is also necessary to consider randomness of samples both vertically and laterally throughout a reservoir. In some reservoirs the variation in properties may be expressed as well by a vertical sampling as by a horizontal sampling. This depends again upon the character of the reservoir, i.e., whether bedded or lenticular, and upon the type of deposition.

Tests are available for demonstrating whether samples are randomly obtained. Such tests are applicable only to those instances where one can be certain that the samples are representative of the system desired and not only of a portion of that system. A demonstration of randomness on test samples obtained on a fractured reservoir would mean merely that the rock between the fractures had been adequately sampled and not that the samples represented the rock-fracture system as a whole.

From this discussion it is apparent that coring data are most reliably obtained and representative of variation in uniform sandstone reservoirs competent enough to permit obtaining complete recovery, less so for sandstones possessing wide heterogeneity or with shaling and lensing, and least so for heavily fractured reservoirs or vugular-type porosity where fluid-containing space is large in dimension. It would also appear that in some instances larger cores would be more appropriate than those normally taken. It is also apparent that an examination of random variations of reservoir properties would aid in evaluating the applicability of coring as a reliable tool in a given situation.

Series by Dr. John C. Calhoun, Jr., Chairman, Petroleum Engineering School, University of Oklahoma

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PIPE LINES

Canadian Line to Start

EDMONTON, Alta.—If weather is favorable, construction on Interprovincial Pipe Line Co.'s new 1,180-mile crude-oil line will begin this month, Dr. O. B. Hopkins, president, announced here last week.

The new pipe line will move Alberta oil to eastern markets. Crude is expected to enter the line at Edmonton this fall and will reach the Great Lakes by the end of the year, Hopkins added.

The crude will be stored at the lakehead until opening of navigation in the spring of 1951, when tankers will deliver it to Ontario refineries.

"While there have been pipe-line projects of greater magnitude than the Interprovincial line," Hopkins said, "none has had such a short working period set for completion." He said that everything possible is being done to complete the work scheduled, particularly in view of the importance to the Canadian economy of an additional crude outlet.

Field men using airplanes, snowmobiles, and horse-drawn sleds, have obtained options on about 90 per cent of the Canadian, and 75 per cent of the U. S. right-of-way for the line.

For the section of the project to be laid by Williams Brothers Corp., 150 miles of pipe has been unloaded and 100 miles strung according to Guy S. Connors, vice president of Williams Brothers.

Operations handled by this contractor for the Interprovincial project are under K. A. Owens, project manager. B. E. Barnes is superintendent of construction at Souris, Manitoba; Ed. Slattery is project auditor, Brandon, Manitoba; O. L. (Whitey) Martin, spread superintendent of Gang No. 1, Morden, Manitoba; R. G. Connelly, office manager, Morden, J. B. Petty, spread superintendent of Gang No. 2, Souris, Manitoba; Walter Hammond, office superintendent, Souris; Clyde Gregory, spread superintendent of Gang No. 3, Kipling, Sask.; Jack Mackie, office manager, Kipling. All equipment is on the job. Construction will commence about May 1.

Italian Line Planned

It has been reported that Condor S.p.A. (Shell) will construct a crude-oil pipe line of approximately 80 miles in length from Genoa to Rho, near Milan, Italy.

The line will have an annual capacity of 1,000,000 bbl., or around 2,750 bbl. daily.

Condor S.p.A. is a Shell affiliate which has headquarters at 44-A Dover Street, London, under D. Brook-Hart. Prof. F. Guarneri of Beni Stabili, an Italian company, is chairman of the board of directors of Condor.

United Laying Line

Construction is now under way for laying 60 miles of 12-in. for United Natural Gas Co. by Williams Brothers Corp. The line is being laid in the Brookville, Pa., area. Field office is at Segel, Pa., under A. T. Maxwell, spreadman.

Transcontinental Survey

In preparing for repeater stations for Transcontinental Gas Pipe Line Co.'s 1,840-mile microwave-communication system to be equipped and constructed by General Electric Co., aerial surveys will be made along the entire pipe-line route by G. E. engineers late this month.

First delivery of microwave equipment will be made early in October. The Houston - New York microwave section is to be completed November 15, and the entire installation will be finished March 1951. *(The Oil and Gas Journal, March 30, page 59; April 6, 1949, page 41).*

Work has begun on foundation for Transcontinental's new $1,000,000 office building in Houston. The three-story structure, which will have a total of 63,360 sq. ft., including basement, is expected to be ready for occupancy next January.

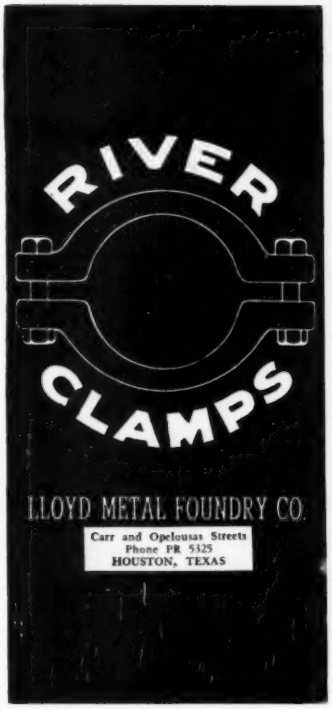
Georgia Line Proposed

WASHINGTON.—South Georgia Natural Gas Co., Atlanta, has asked the Federal Power Commission for authorization to build about 248 miles of natural-gas pipe line to serve distributors in southern Georgia.

The proposed system, which would cost $6,600,000, would have a capacity of approximately 40,000,000 cu. ft. of gas daily. It would include a 144-mile line extending from a connection with Southern Natural Gas Co.'s proposed extension of its system in Talbot County, Georgia, southeasterly to Brooks County. A series of eight lateral lines, totaling 104 miles, would extend from this main line to various Georgia communities.

Another application proposing service to some of the same Georgia communities sought to be served by South Georgia Natural was recently filed with FPC by Georgia Natural Gas Co., Albany *(see page 281 of this issue)*.

Application of South Georgia Nat-



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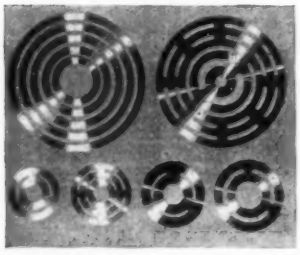

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ural says that it contemplates that other laterals would be constructed from the main trunk line to the distribution systems by the distributors themselves, both private and municipal.

Montana Work Progressing

THREE FORKS, Mont.—Work is progressing on Montana Power Co.'s 83-mile natural-gas line over the Rocky Mountains in this area of southwestern Montana.

By taking advantage of subzero temperatures during the winter, workers placed the 12¾-in. line under the Jefferson and Gallatin rivers while the streams were low. Now work is being rushed on the Madison River crossing.

Pipe is coated with coal tar, enamel, and waterproof sheathing to resist the effects of water. The line is buried more than 8 ft. under the rivers, and cast-iron weights of 1,100-lb. each are clamped to the pipe every 30 ft. to anchor it.

Montana Power's new line will run from Bozeman to Butte in a straight line. It will be laid over the main divide of the Rocky Mountains north of Whitehall. Highest post at Homestake Pass is 6,356 ft. above sea level.

Engineers estimate that 110,000 cu. yd. of earth and rock will be moved in digging the 435,493-ft. long trench. More than 10,000 tons of steel will be used in the welded line.

When completed this summer, the line will connect Montana Power's service between northern and southern Montana. Towns to get gas for the first time will include Whitehall, Belgrade, Three Forks, and Manhattan, all in Montana.

Pilots Take Over

There are now 89 airplanes in the United States used exclusively for pipe-line work, according to The Lamp, publication of Standard Oil Co. (N.J.), and as many pilots, who are replacing the old pipe-line walkers.

Aerial patrols have come into wide use since World War II. Until then the pipe-line patrol was exclusively a foot job carried on by line walkers. Many times breaks in lines were not reported quickly enough by the old method. Now, with pilots patroling lines, leaks can be detected, and word spread quickly.

Pipe-Shipment Record

NEW YORK.—Shipments of steel pipe set a record in 1949, American Iron & Steel Institute reported recently. The total of all kinds of steel pipe was 6,935,220 net tons, an increase of 55,671 tons.

Pipe constituted 12 per cent of total steel shipments last year, against 10.4 per cent in 1948, the institute said.

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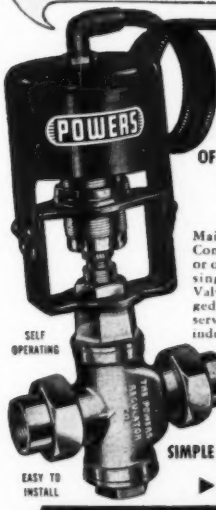

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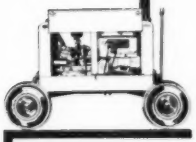

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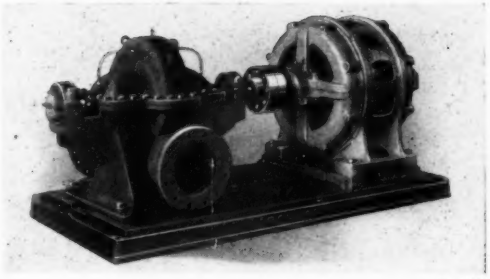

Fig. 3450

For heavy duty, large capacity jobs . . . Goulds double suction centrifugals

TYPE Centrifugal, single stage double suction with horizontally split casing. Capacities: to 15,000 G.P.M. Heads: to 500 feet depending on capacity. Sizes: 2" to 16".

USES General water supply; water works; circulating and booster service; low pressure boiler feeding.

ADVANTAGES Rugged, heavy duty construction; may be dismantled without disturbing pipe connections. Made in bronze fitted, all iron, and all bronze constructions.

Other Examples of Goulds Complete Line

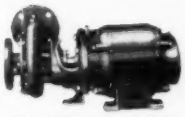

Fig. 3650—Cap. to 2000 G.P.M. Heads to 400 ft. Sizes 1" to 6".

Fig. 3105—Cap. 250 to 4500 G.P.M. Heads to 220 ft. Sizes 4" to 8".

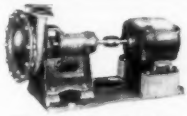

Fig. 3705 — Stainless Steel — Cap. to 600 G.P.M. Heads to 200 ft. Sizes 1" to 3".

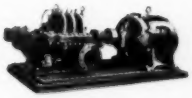

Fig. 3330 — Cap. 40 to 2000 G.P.M. Heads to 3200 ft. Sizes 2" to 8".

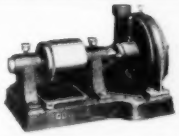

Fig. 3010—Cap. 5 to 100 G.P.M. Heads to 70 ft. Sizes 1", 1½", 2".

Fig. 3648—Cap. to 35 G.P.M. Pressures to 190 lbs. Sizes ¼ H.P. to 5 H.P.

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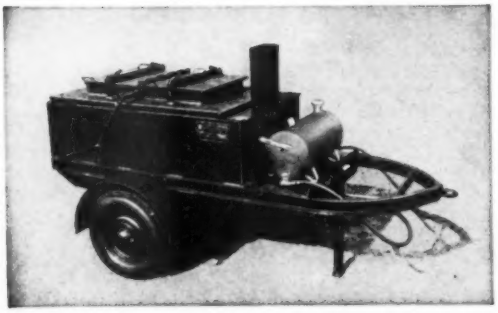

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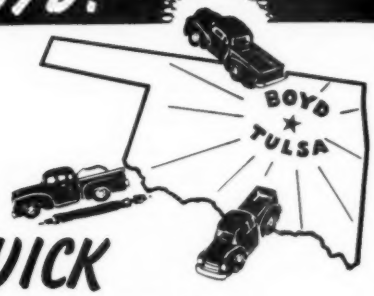

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Pipe-Line Construction

FOLLOWING is a tabulation of domestic pipe-line projects which are planned or under construction. Included are crude-oil, products, and natural-gas lines. The list was compiled from surveys made by The Oil and Gas Journal.

Crude-Oil Pipe Lines

Gulf Refining Co.—29 miles 8-10-in. lateral in Scurry County, Texas, under construction; Latex Construction Co., contractor; J. B. Latham, superintendent; field office, Loraine, Tex.

Humble Pipe Line Co.—371 miles, 18-in., under way, West Texas-Satsuma Station to Baytown, Tex.; 178-mile western section contracted to Morrison Construction Co.; 193-mile eastern section contracted by Anderson Brothers Corp.

Magnolia Petroleum Co.—60 miles 4-24-in. gathering system in La Ward and Lolita fields, Texas; Henry L. Lemons & Co., contractor; W. A. Remington in charge.

Mid-Valley Pipe Line Co. (Sun and Sohio)—1,000 miles, 20-22-in., under way, Longview, Tex., to Mayersville, Miss.-Covington, Ky., to Lima, Ohio. Contracts let for 857 miles as follows: Section 2, Haynesville, La., to Mayersville, Miss., Latex Construction Co.; spread office, Farmerville, La.; F. A. Silar, general superintendent; W. A. Briley, spread superintendent; office at Haynesville, La., W. H. Hayes, superintendent; M. L. Thompson, assistant superintendent. 41 miles, 12-in., lateral, Delhi to Lake Providence, La.; headquarters, Lake Providence; E. C. Norris, general superintendent; R. E. Thornton, superintendent. Section 3-A, Mayersville to Oakland, Miss., Associated Pipe Line Contractors, Inc.; J. A. Williams and L. H. Gray, spreadmen; Section 3-B, 4-A, Oakland, Miss., to Henderson, Tenn., Houston Contracting Co., E. C. Norris, superintendent; field office, Batesville, Miss.; Section 4-B, 5-A, Henderson to Clarksville, Tenn., Eastern Construction Co.; work started April 1; to be completed by September 1, 1950. Louie Stewart and Cliff Simmons, spreadmen; field offices, Clarksville and Lexington, Tenn. Section 5-B, 6-A, Clarksville, Tenn., to Elizabethtown, Ky., field office, Clarksville, Fred L. Byers, superintendent; Britton Construction Co.; Section 6-B, 111 miles of 22-in., Elizabethtown to Hebron, Ky., H. L. Gentry Construction Co., Frank Morris and Jim Mitchell, spreadmen; Section 7 South, Hebron, Ky., to Eaton, Ohio, Britton Construction Co., field office, Hamilton, Ohio; spreadman, Fred Peters; Section 7 North, Eaton to Lima, Ohio; Section 8, Magnolia, Ark., to Haynesville, La. Longview, Tex.-Haynesville, La., section, 110 miles 20-in., contracted to O. R. Burden Construction Co.; G. A. Lewis, spreadman; office, Marshall, Tex.

Cumberland and Tennessee rivers, Eastern Construction Co.; field office, Clarksville, Tenn., Fred L. Byers, spreadman.

Naph-Sol Refining Co.—25 miles 6-in., under construction, Kimball Lake oil field, Newaygo County, Michigan, to refinery at Muskegon; Young Construction Co., Olney, Ill., contractor.

Pan American Pipe Line Co.—80 miles, 10-in., southern part of Scurry County, Texas, to connect with Humble Pipe Line Co.'s system near San Angelo, Tex. Work to begin in May. (Contract not let.)

Phillips Petroleum Co.—45 miles 2-24-in., gathering system near Andrews, Tex.; Vaughn & Taylor Construction Co., contractor; Jess Moore in charge.

Pasotex Pipe Line Co.—32 miles 4-8-in., authorized, North Snyder, Tex., lines for gathering, delivery to Basin System.

Portland Pipe Line Co., Montreal Pipe Line Co., Ltd.—236 miles, 18-in., planned, Portland, Me., to Montreal, Que., Canada, contracted as follows: Oklahoma Contracting Co., 85 miles in Section 1 at southern end; Portland, Me., to Gorham, N. H.; H. A. Wylie, superintendent; Lisle W. Chambers, paymaster; office, Westbrook, Me.; work starts June 1. Associated Pipeline Contractors, Inc.; L. H. Gray, spreadman. Section 2, 81 miles; and Fred Mannix Co., Ltd., 68 miles, Section 3, in Canada.

Richfield Oil Corp.—40 miles, 10-in., Cuyama Valley-Newhall, Calif., planned. 60 miles, 14-in., applying field joints, Newhall-Wilmington, Calif., under way.

Stanolind Pipe Line Co.—36 miles, in Kent County, Texas, outlet for Scurry County crude.

Texas-Empire Pipe Line Co.—42 miles, 16-in., authorized, Wilmington, Ill., to East Chicago, Ind.; O. E. Burden Construction Co., contractor; Pete Hiner, spreadman; office, Wilmington, Ill.

Texas Pipe Line Co.—42 miles $12\frac{3}{4}$-in., Patoka, Ill., to Clay City, Ill.; L. R. Young Construction Co., contractor.

Texas-New Mexico Pipe Line Co.—37 miles, 10-in., proposed, Scurry County, Texas.

Products Pipe Lines

Great Lakes Pipe Line Co.—261 miles, 12-in., under way; contracted as follows: 52 miles, 15-in., Albert Lea to Fairbault, Minn.; under construction; Sheehan Pipe Line Construction Co., contractor; field office, Albert Lea, Minn.; C. W. Henderson, spreadman. 50 miles 12-in., St. Paul to Fairbault, Minn.; J. W. Brown, spreadman; office, Northfield, Minn. 50 miles 12-in., State Line to Fairbault, Minn., C. M. Brown, spreadman; office, Albert Lea, Minn. O. R. Burden Construction Co., 64 miles north from Des Moines; field office, Nevada, Iowa; G. D. Lewis, spreadman; A. C. Holder Construction Co., 72 miles to Iowa-Minnesota state line; Williams Brothers Corp., 20 miles, Mississippi River crossing and line to terminal and station. Kansas and Missouri river crossings, R. H. Fulton & Co.; field office, Kansas City; Ed Veach, spreadman.

Second 12-in. line to be constructed between Barnsdall, Okla., and Kansas City, Kans., paralleling the 12-in. recently completed, and three existing 8-in. lines. Work to start as soon as pipe is delivered.

290 miles, 12-in., Tulsa to Kansas City, Mo. Contracted as follows: 54 miles, Ponca City to Barnsdall, Okla., O. R. Borden Construction Co.; and 236 miles, Barnsdall, Okla.-Kansas City, Mo., Pacific Pipe Line & Engineers, Ltd. James Howe, superintendent for Pacific Pipe Line portion is headquartered at Chanute, Kans.; spread office at Tulsa with Ham Hamilton general spreadman and river-crossing spreadman; spread office at Dewey, Okla., Loue Robertson, spreadman; and spread office at Paola, Kans., Larry Webb, spreadman.

355 miles, 12-in., authorized, Kansas City through Omaha and Sioux City, Iowa, to Sioux Falls, S. D.

189 miles, 12-in., authorized, Kansas City to Des Moines, contracted as follows: 36 miles 12-in., Kansas City, Mo., northward through Platte, Neb.; Trojan Construction Co., contractor; field office, Parkville, Mo.; Swede Tillotson, spreadman; $37\frac{1}{2}$ miles, 12-in. Clay, Clinton, DeKalb, and Daviess counties, Missouri; Trojan Construction Co., contractor; field office, Cameron, Mo.; Felix Johnson, spreadman; Brodie Construction Co., 37-mile middle section; field

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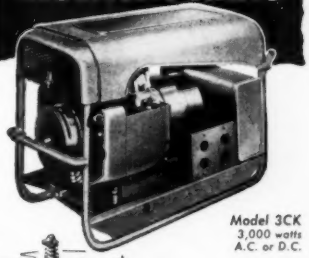
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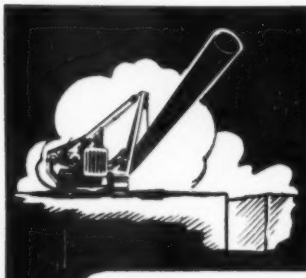

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office, Bethany, Mo.; A. T. Rathjen, spreadman; R. H. Fulton & Co., two 38-mile northern sections, Osceola to Des Moines, Iowa; Jerry Nash, spreadman; office, Osceola.

48 miles, 8-in., authorized, Cushing-Drumright-Tulsa, Okla.; Trojan Construction Co., contractor; field office, Sapulpa, Okla.; Slim Deaver, spreadman.

Phillips Petroleum Co.—155 miles 6-in., extension to present 200-mile line from Phillips, Tex., to LaJunta, Colo., on to Denver.

Standard Oil Co. (Ohio).—38 miles 8-in., authorized, Toledo to Fostoria, Ohio.

Salt Lake Pipe Line Co.—242 miles, 6-8-in., Boise, Idaho-Pasco, Wash., planned. Contracted as follows: Morrison-Knudson Co., Inc., Macco Corp., and Bechtel Corp., 140-mile section from Boise to Baker, Idaho; Pacific Pipeline & Engineers, Ltd., Baker to Pasco, Wash.

63 miles 8-in., Mountain Home to Boise, Idaho; Oklahoma Contracting Corp., contractor; Aldress Kilgore, supt.; R. F. Mueller, paymaster. Office, Mountain Home. Construction to begin May 1.

Natural-Gas Pipe Lines

Alabama-Tennessee Natural Gas Co.—80 miles 10-in., under way, Selmer, Tenn., to Muscle Shoals, Ala.; 35 miles 8-in., authorized, Muscle Shoals to Decatur, Ala.

Algonquin Gas Transmission Co.—276 miles, Lambertville, N. J., to Boston area, proposed.

492 miles laterals, New England area, proposed.

Atlantic Gulf Gas Co. (United Gas Pipe Line Co.)—1,530 miles, planned, Alabama-Florida-Georgia-South Carolina.

Central Hudson Gas & Electric Corp.—40 miles, authorized, Tuxedo, N. Y., station, Home Gas Co. line now under construction, to Poughkeepsie, N. Y.

Central Kentucky Natural Gas Co.—36 miles, 12-20-in., planned, Kentucky loops.

Chicago District Pipe Line Co.—41 miles, 24-in., planned, Joliet, Ill., to Chicago.

City of Indianapolis, Ind., Inc.—55 miles 16-in., proposed, Indianapolis to Texas Eastern Transmission Corp.'s system.

Cities Service Gas Co.—47 miles, 3-4-16-in. planned, in Kansas.

Coastal Pipe Line Co.—1,000 miles, planned, Texas to Norfolk, Va.

Colorado-Wyoming Gas Co.—41 miles, planned, Greeley, LaSalle, and Windsor, Colo., areas.

Commonwealth Natural Gas Corp.—537 miles, 20-in., planned, West Bend, Ky., to Norfolk, Va.

200 miles, authorized, Green County, Virginia, to Norfolk.

East Tennessee Natural Gas Co.—185 miles, 16-in., Lobelville-Chattanooga, Tenn., contracted by Walters & Saigh Construction Co., for construction in 1950; 120 miles, 12-in., Chatanooga-Knoxville, Tenn.; contracted by Walter and Saigh Construction Co., for construction in 1950; 100 miles of laterals to be laid in 1950. Construction 150 miles, 16-in., Knoxville-Bristol, Tenn., under consideration.

El Paso Natural Gas Co.—All work done by company crews.

Looping of 26-in., New Mexico-California line and connection with **Pacific Gas & Electric Co. at Needles, Calif.** 352 miles 30-in., completion November 1950; spreads as follows: 119 miles 30-in., Wenden to Topock, Ariz., Ed Alsup, spreadman; office, Salome, Ariz.; (Spread No. 2 is shut down due to lack of pipe; office, Jal, N. M., Jack Smith, spreadman); 15 miles 2-in., Bowie, Ariz.; G. George, spreadman; office, Casa Grande, Ariz. In July company will continue two spreads on 30-in. loop project which lacks 169 miles for completion.

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450 miles, 30-in., under construction, Eunice, N. M.-Blythe, Calif., looping; completion March 1950.

450 miles, 24-in., planned, San Juan basin, New Mexico to Franconia, Ariz.

Home Gas Co.—70 miles, planned, Orange, Sullivan-Rockland counties, New York-Cattaraugus County, New York, areas.

Jersey Central Power & Light Co.—39.4 miles, 10-in., planned, New Jersey to Coast system, Texas Eastern Transmission Co.'s Big Inch.

Michigan-Wisconsin Gas Co.—185 miles, 4-14-in. laterals, Milwaukee-Fond du Lac, Sheboygan, and Green Bay, Wis., under construction; C. C. Griffis Construction Co., contractor; Paul Means, superintendent for Lake Del Mort crossing.

Montana-Dakota Utilities Co. and Montana-Wyoming Gas Pipe Line Co.—340 miles, 12¾-in., planned, Worland, Wyo., to Cabin Creek, Mont.; R. A. Conyes Construction Corp., contractor; Al Poggi, general superintendent; Chester Kincaid and Jimmy Alman, spreadmen.

Montana Power Co.—83 miles, 12¾-in., planned, Butte to Bozeman, Mont.; field office, Three Forks, Mont.; C. N. Deaton, spreadman.

New York State Natural Gas Corp.—53½ miles 16-in., loops, Pennsylvania.

Northeastern Gas Transmission Co.—511 miles, up to 20-in., planned, in New England area.

Northern Natural Gas Co.—41 miles, 20-in., under construction, Southwest from Garden City, Kans.; R. H. Fulton & Co., contractor.

597 miles of looping in 10 sections, contracted as follows: R. H. Fulton & Co., loops 1 to 5: loop 1, 40.2 miles, 26-in., extending northward from a point 28.7 miles north of Skellytown station in Pampa, Tex., area; loop 2, Beaver, Okla., station, 74.9 miles, 26-in.; loop 3, Mullinville, Kans., station, 33¼ miles, 26-in.; loop 4, Bushton, Kans., station, 72½ miles, 26-in.; loop 5, from a point west fo Garden City, Kans., to Bushton, Kans., station, 155 miles, 20-in. M. L. Boyd, spreadman; office, Perryton, Tex.; and N. A. Veach, spreadman; office, Liberal, Kans. Midwestern Constructors, Inc., loops 6 and 7; loop 6 from a point 29 miles northeast of Palmyra, Nebr., station, 43.4 miles, 26-in., to Oakland, Iowa, station; loop 7, from a point 17.8 miles northeast of Oakland, Iowa, station, 65.9 miles, 26-in. R. B. Potashnick, loops 8 to 10; loop 8, southwestward from Ventura, Iowa, station, 31.2 miles, 26-in.; loop 9, northward from Ventura station, 41 miles, 26-in.; loop 10, from the north end of a 26-mile gap beyond loop 9, where another loop will be built consisting of 39½ miles, 26-in.; total 111 miles, 24-in.; field office to be located at Ogden, Iowa, June 1; Boyd, spreadman.

Northwest Natural Gas Co.—750 miles planned; Washington, Oregon, and Idaho.

Pacific Gas & Electric Co.—506 miles 34-in., under construction, Topock, Ariz.-Milpitas, Calif.; Bechtel-Price-Conyes, contractor; main-line office, Barstow, Calif.; R. L. Bowman, general superintendent.

Panhandle Eastern Pipe Line Co.—356 miles, 26-in., authorized, looping in Texas, Oklahoma, Kansas, Missouri, Illinois, Indiana, Ohio, and Michigan.

Peoples Gas Light & Coke Co.—Planned 42 miles, 24-in., Joliet-Chicago, Ill.

Phillips Petroleum Co.—25 miles gathering system in West Edmond, Okla., field; under construction; Vaughn & Taylor Construction Co., Inc., contractor; spread office Edmond, Okla.

118 miles, 3-to-20-in., gas-gathering system in Sherman and Hansford counties, Texas; Vaughn & Taylor Construction Co., Inc., contractor; D. D. Vaughn, spreadman; field office, Texhoma, Okla.

Piedmont Natural Gas Corp.—1,350 miles, 30-in., planned, Greenville, Miss., to Norfolk, Va.

Plains Natural Gas Co.—78 miles, gathering system, Oklahoma-Kansas area, Hugoton field. Contracted by: Arey-Phillips Construction Co., Amarillo, Tex.; Tulsa Pipe Coating Co., Mid-Western Constructors, Inc., Engineering and supervision. Latter firm represented by Lyle DeWitt; field office, Liberal, Kans.

Roanoke Pipe Line Co.—30 miles 8-in., Gala, Va., to Roanoke, authorized.

South Jersey Gas Co.—77 miles, planned Camden to Atlantic City.

Southern California Gas Co.—80 miles 30-in., Whitewater to Puente, Calif., planned.

Southern Natural Gas Co.—375 miles, 24-in., planned, Gwinville, Miss., to Atlanta.

225 miles, 16-in., planned, Colfax, Ga., extension.

110 miles, 11-in., considered; extension.
314 miles, 18-in., planned; extension.
171 miles, 16-in., planned; extension.
118 miles, 13-in., planned; extension.

Southern Union Gas Co.—78 miles, 8-10-14-in., planned, New Mexico loops and laterals.

Tennessee Gas Transmission Co.—65 miles, 16-in., planned, Ohio-Pittsburgh spur.

790 miles, 20-26-in., planned, Burnaugh, Ky., to Boston, including 400-mile line to Buffalo.

992 miles, 30-in., planned, first 150 miles of loops to be laid at Monroe, La., Greenville, Miss., Midland and Portland, Tenn.

385 miles 26-in., Greenup County, Kentucky, to New York; contracted to H. C. Price Co., Bartlesville, Okla. Work to start in April.

Latex Construction Co. has following contracts: 123 miles, 30-in., West Monroe to Many, La., W. H. Hayes, superintendent, field office, Jonesboro, La.; 54 miles, 16-in. and 12-in., Kinder to Grand Chenier, La., F. A. Silar, superintendent, headquarters, Kinder, La.; 95 miles, 30-in., Natchitoches to Kinder, La., F. A. Silar, superintendent, W. A. Briley, assistant.

54.2 miles, 30-in., under construction, White Bluff area to Joelton, Tenn., area, contracted to Morrison Construction Co.

36.1 miles, 30-in., under construction, **Glasgow, Ky., area to Joelton area, contracted to Morrison Construction Co.**

18.1 miles, 30-in., under construction Union City to Buckeye, Ky., Anderson Brothers Corp., contractors.

63 miles 26-in., Mahoning River near Youngstown, Ohio, southward; H. C. Price Co., contractor; G. A. Reutzel, supt.; field office, Columbiana, Ohio. 63 miles 26-in., Muskingum River northeastward; R. K. Shivel, supt.; office, Zanesville, Ohio; 47 miles 26-in., Muskingum River southwestward; W. B. Williams, supt.; office, McConnelsville, Ohio; 47 miles 26-in., Ohio River northeastward; C. R. Ice, supt.; office, Portsmouth, Ohio. (Balance of 373-mile Ohio River-Buffalo project to be started in August 1950.)

27.7 miles, 12-in., under construction, El Campo, Tex., to near Traitor, Tex.; Massey Construction Co., contractor.

25 miles, 30-in., Hardeman and McNairy counties, Tennessee; H. C. Price Co.; field office, Selmer, Tenn.; J. A. Reutzel, spreadman.

103 miles 30 and 26-in. loops, Premont to El Campo, Tex.; Oklahoma Contracting Corp., contractor; M. E. Shiflett, supt.; Joe Freeman, paymaster. Work under way.

70 miles, 26-30-in., between stations 104 and 110; Anderson Brothers Corp.; field office, Richmond, Ky.; E. C. McCoy and Arkie Hobson, spreadmen.

170 miles of 26 and 30-in., contracted by Anderson Brothers Corp., in Kentucky

91 miles 30-in., Holly Springs, Miss., south; contracted to Oklahoma Contracting Corp.; Raymond Law, supt.; Gene Gohring, paymaster; office, Holly Springs; work to begin June 1.

FLEET-LINE*

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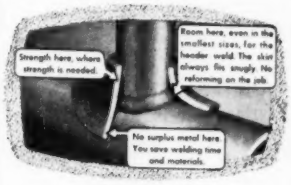
PIPE SADDLES

ASTM A234


Strength here, where strength is needed.
Room here, even in the smallest sizes, for the header weld. The shirt always fits snugly. No reforming on the job.
No surplus metal here. You save welding time and materials.

YOU SAVE

welding time and materials

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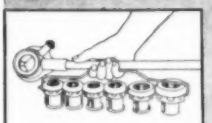

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No. 3 Ratchet Threader For Pipe, Bolts, Conduit

Beaver No. 3 Ratchet Threader is a deluxe tool with fully-enclosed ratchet teeth that cannot get gummed-up or mutilated—thus eliminating the danger of serious accidents caused by ratchet slippage.

Die segments square in shape—no weak sections—are easily removable for sharpening and can be inverted for close threading. Ample openings between segments for oiling and chip clearance.

Diehead carrier free—enclosed metal tool-box available extra.

Beaver No. 3 threads Pipe, ⅛ to 1"; Bolts, ¼ to 1"; Conduit, ½ to 1"; Brass Tubing, ¼-20; ⅜ or ¼-27 Thread. Also specials.

Write for complete new Catalog No. 49 —free! It shows a complete line of hand tools, ⅛ to 12-inch; electric pipe & bolt machines, power drives, etc. Address Beaver Pipe Tools, Inc., 244-300 Dana Avenue, Warren, Ohio, U. S. A.

50 Years of Friendly Service

BEAVER PIPE TOOLS

Texas-Eastern Transmission Corp.—1,400 miles planned, Texas to Pittsburgh loops.

108 miles 16-in., authorized, Provident City to Baytown, Tex.

33 miles, 20-in., Hankamer to Beaumont, Tex.; Associated Pipe Line Construction, Inc., contractor; field office, Liberty, Tex.; C. E. Rogers, spreadman.

Texas Gas Transmission Corp.—10 miles, 20-in., Carthage, Tex., to near Lisbon, La., (Sharon), under construction. N. A. Saigh Co., Inc., contractor; Carthage, Tex.; Bob Floyd, representative. Construction subcontracted: (1) Fowler Brothers, 4 miles from Carthage to Red River, field office at Carthage; M. C. Johnson, spreadman; (2) 63 miles to Sharon station, Oklahoma Contracting Co. (J. R. Horrigan) field office at Minden, La.; Ed Flanagan, spreadman.

32 miles, planned, Slaughters, Ky., to Evansville, Ind.

Texas Illinois Natural Gas Pipeline Co.—1,400 miles, 30-in., planned, La Gloria field, Texas, to Joliet, Ill.

58-mile, 20-in. lateral, Joliet terminal to connection with Natural Gas Pipeline Co. of America near Volo, Ill.

Transcontinental Gas Pipe Line Co.—Texas-New York 1,840 miles, 30-in., main line and 500 miles, 4 to 22-in., gathering line. Section of 605 miles of 30-in. nearing completion.

Section 6, Newman, Ga., to Danielsville, Ga., 108 miles; Williams Brothers Co.; field office, Monroe, Ga.; Thelmer Davis, spreadman. Section 7, Danielsville, Ga., to Saluda River, South Carolina; 86 miles; Williams Brothers Co. Section 8, Saluda River, South Carolina, to Catawba River, North Carolina, 102 miles, R. H. Fulton & Co. Section 9, Catawba River, North Carolina, to North Carolina-Virginia boundary, 100 miles; Clark Williams, spreadman; field office, Spartanburg, S. C. R. H. Fulton & Co.; A. A. Corrigan, supt.; Clark Williams, general supt. Section 10, North Carolina-Virginia boundary to James River, Virginia, 86 miles; O. R. Smith Contracting Corp. Section 11, James River, Virginia, to Potomac River, Virginia; 110 miles; O. R. Smith Contracting Corp. Section 12, Potomac River, Virginia, to Susquehanna River, Pennsylvania, 76 miles; Associated Engineers & Contractors, Inc. Section 13, Susquehanna, Pennsylvania, to Delaware River, 90 miles; Wunderlich & Griffis Construction Co. Section 14, Delaware River to Hackensack River, New Jersey, 61 miles, Wunderlich & Griffis Construction Co. Section (unnumbered), Hackensack River, New Jersey, to Hudson River, New York, 23 miles; Oklahoma Contracting Co.; field office, Edgewater, N. J.; M. E. Shiflett, spreadman.

616 miles main and gathering lines west and south of Eunice, La. (361.1 miles is for main line and 255 miles for gathering lines.) Contracted as follows:

Schedule A.—Mercedes to south of Falfurrias, Tex., 80.1 miles 10 to 14-in. main line; Massey Pipe Line Construction Co., contractor; work to start in April or May.

Schedule B.—South of Falfurrias to Edna, Tex., 153.1 miles, 24 and 26-in. (H. B. Zachary Co., San Antonio, has contracted laying of 108 miles 24-in. in Schedule B.) Remaining 45 miles yet to be contracted. Work starts September 1.

Schedule C.—Edna to Porters, Tex., 114.9 miles, 26 and 30-in., to start in August. Contract to be announced.

Schedule D.—Porters to Sabine River, 91.5 miles, 30-in., contracted by Texas Southern Contracting Co., Fort Worth.; work to start in July.

Schedule E.—Sabine River to Eunice, La., 81.5 miles, 30-in., contracted by Anderson Brothers Corp., Houston; work starts in July.

Texas Unit L.—Gathering laterals to begin in May; El Campo, Tex., area, 58 miles 4 to 14-in., contracted to T. & R. Construction Co., Houston. Wharton, Tex., area, 98 miles, 6 to 14-in., contracted to Altgelt Construction Co.

(Continued on page 297)

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FOR AM, FM, UHF, VHF, MICROWAVE, TELEVISION AND RADAR
Emsco guyed triangular radio towers are engineered for high wind load capacity, low maintenance costs and perfect transmission pattern . . . for all types of communication . . . in all industries. Standard towers available with 20½", 3', 5' or 14' faces, heights to 1000 feet and to withstand 20, 30 or 40 pound wind loads.
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Shown here is an Emsco 20½-inch face, 160-foot Type IRT Emsco radio tower with 30-pound wind load rating.

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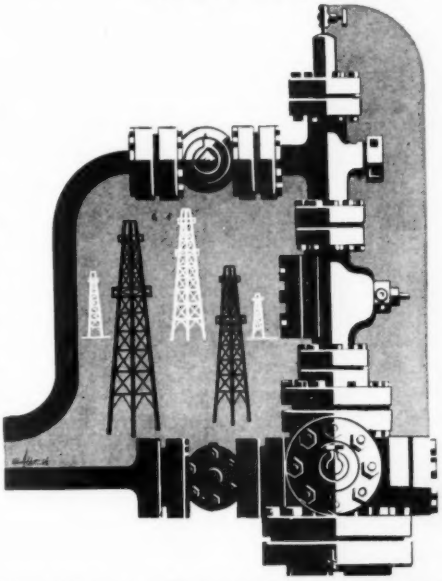
10,973,583 Barrels, 717 Wells

1949 PRODUCTION
20,400,000 Barrels, 1,219 Wells

The development of the field is just beginning. If you sell equipment — or are interested in any phase of Canada's oil industry, write to us for information you require. Apart from providing a full banking service "in the field" as well as across Canada, we are interested in helping you become established and well connected.



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We were making our usual calls down in the lower part of the state, last week, when we saw this new rig operating.

Naturally, we stopped over to have a look-see and, of course, just happened to mention Gyrol Fluid Drives to the rig boss.

"Gyrol Fluid Drives!" he says, whipping around. "Let *me* tell *you* about Gyrol Fluid Drives!

"I wouldn't use anything else *but* Gyrol Fluid Drives on my rig. Why, they give me the smoothest starts I ever had—even against a full connected load. What's more, I can accelerate as fast as I want without stalling. I get more stable drilling speeds on the rotary, and I can stretch the setup on the slush pump without bogging down."

We were speechless. He had taken the words right out of our mouth. And he was right—absolutely right!

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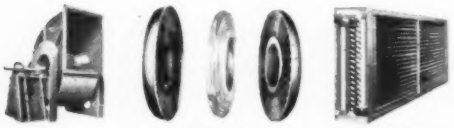

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● The stuffing box clamp of the Norris Brothers Polished-Rod Liner is *right side up*, permitting packing from top. Two set screws provide for extra safety.

- Liner tube is tapered at top end (not flared) and is reinforced with an internal ring or sleeve which fits into and reinforces the liner.
- Packing is all placed above taper end of liner—the proper position for best results.
- Both stuffing box and stuffing box clamp come packed with the very finest of packing.

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FOR over 30 years we have been devoting our efforts to building better pumping units. During this time we have developed mass production methods and thoroughly field tested our design.

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JENSEN Bros. Mfg. Co.

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Among the Drilling Contractors

Indiana Operators Drill Wildcat Test in Canada

Among the latest participants in western Canada's exploration program are George C. Schoonmaker and J. M. McCummings, independent operators, Evansville, Ind. Their first drilling venture in that region is located in the Saddle Lake area, 12 miles southwest of St. Paul, 80 miles northeast of Edmonton, eastern Alberta Province. This wildcat, 1 Saddle Lake, LSD 9, 18-57-11w4, is being drilled under contract by **Lodester Drilling Co.**, Calgary. It is projected to the Devonian, expected around 3,500 ft. Location is about 14 miles southwest of gas production in the St Paul area.

Martin Harris Rig Drills Mississippi Deep Wildcat

Tools of Martin Harris Drilling Co., Jackson, Miss., at latest report were making hole below 16,025 ft. at Mississippi's deepest test, George Vassen and associates 1 Tung, C SW NE 9-2s-11w, a wildcat northeast of Wiggins, Stone County. The depth is 305 ft. below that of the state's previous deepest test. The latter was Superior Oil Co. 1 Bradford, in Forrest County, which was abandoned in 1946 at a total depth of 15,730 ft.

Longhorn Drilling Corp., San Antonio and Three Rivers, Tex., has the contract for a projected 7,000-ft. wildcat test to be drilled for Freeport Sulphur Co. in Webb County, Texas. Location is in Section 103 of the Thomas Dix ranch, 26 miles north of Laredo, located on the Mexican border.

Mitchell-Gage Drilling Corp., Oklahoma City, is drilling a 5,500-ft. Wilcox sand test for Porter Oil & Gas Co. at 1 Staples, 8-21n-2w, 2½ miles northeast of Staples, Noble County, Oklahoma. Location is about 2 miles northwest of the Sams pool, nearest production.

Milton Crow, Inc., Shreveport, has a contract for a 6,000-ft. wildcat test to be drilled for Pan-Am Southern

Toolpusher and day-tour crew on a well which Kerr-McGee Oil Industries, Inc., Oklahoma City, is drilling for Cities Service Oil Co. near Snyder, Scurry County, Texas. Top row, left to right: C. F. Cahill, driller; Jack Patton, toolpusher; Jake Klusmeyer and R. C. Avara, floormen. Bottom row, same order: Virgil Chollis, motorman; Cecil Thorpe, derrickman.

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TOOL JOINTS

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CASING HEADS

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HINDERLITER TOOL CO., DIV.
H. K. PORTER COMPANY, INC.
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USE 'BESTOLIFE IT'S BETTER

'BESTOLIFE—the Lead Seal Joint Compound used successfully in the Drilling and Refining Industries for years — is immediately available through more than 100 distributors in the U.S.A. Your nearest supply house field store probably has 'BESTOLIFE in stock for immediate delivery. Use 'BESTOLIFE — It's BETTER!

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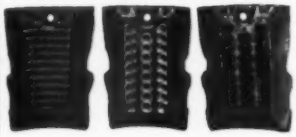
VARCO

CASING SPIDER — AND ELEVATOR SEGMENTS WITH 'VARCO' BUTTONS



"Varco" buttons, popular for years in rotary drill pipe slips, proved satisfactory and have been adopted and are installed in segments of automatic casing spiders and elevators of various makes. Wickers are removed and holes bored for a maximum number of VARCO casing buttons, to assure uniform and maximum gripping area. Converting buttons for the next smaller casings are available. Write for complete descriptive data.

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P. O. Box 748, Odessa, Texas

Corp. in Miller County, Arkansas. The test, 1 Magee, is in 19-17s-25w, about 8 miles northwest of the McKamie-Patton field.

Little & Myers Drilling Co., Oklahoma City, has moved a rig to a wildcat location southwest of Medford, Grant County, Oklahoma, where it has the contract to drill a test, 1 Biggs, SW SW NE 8-26n-5w, for Hunter Marston, Jr., and J. Ben Russell.

Broday Drilling Co., Wichita Falls, Tex., is contractor and joint operator with Redman Brothers on a wildcat test being drilled 5 miles northeast of St. Jo, Cooke County, North Texas. Location for the test, 1 Wheeler, is in the R. Ledbetter Survey.

J. B. Fletcher, Shreveport, has the contract for a projected 8,500-ft. wildcat test, 1 Howard, to be drilled for Tip Ray and C. Latimer in the C SE SE 8-10n-4e, 4 miles southeast of Sharpsburg, Lincoln County, Mississippi.

Fortenberry Drilling Co., Natchez, Miss., is drilling a wildcat test $2\frac{1}{2}$ miles southeast of Knoxville, Franklin County, Mississippi, for R. A. Campbell. Location is C SW SE 37-5n-1e.

Patrick Drilling Co., Inc., Houston, is the contractor on Gulf Refining Co.'s latest well to be started in the Soso field, Jones County, Mississippi. The well is 1 Welch, C NW SW 31-10n-12w.

Hayes & Sprague, Inc., Los Angeles, is the contractor for General Petroleum Corp. on a deep test, 1 Boston Land Co., being drilled near Huron, Fresno County, California.

McIvor Drilling Co., Calgary, has a contract for two wells which Canadian Western Natural Gas Co., Ltd., has projected for the Bow Island gas field, southeastern Alberta Province, Canada. Drilling already is under way on the first, 28 Bow Island. Both will be drilled to the Bow Island gas sands found at depths of 2,000 to 2,200 ft.

ROTARY RIGS IN OPERATION*

(United States and Western Canada)

Area—	Week ended 4-10-50	Change week ended 4-3-50	Change week ended 4-11-49
Gulf Coast	514	+17	— 50
W. Tex.-N. M.	728	— 4	+157
Ark.-N. La.-E. Tex.	122	+ 3	— 21
Oklahoma	256	+ 8	— 13
Kansas	120	+ 8	+ 13
Illinois-Eastern	94	0	— 3
Rocky Mountains	66	+ 1	— 38
Pacific Coast	128	— 4	— 61
Total United States	2,037	+29	— 16
Western Canada	64	— 6	— 11
Total	2,101	+23	— 27

*Courtesy Hughes Tool Co.

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MINNEAPOLIS 1, MINNESOTA

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These days, competitive necessity demands an alertness and business acumen that only a wide awake, thoroughly trained man can handle. That's why the 17,000 Cities Service dealers are a hand picked lot. That's why . . . come what may in the battle for supremacy . . . Cities Service dealers consistently stand out.

Behind every Cities Service dealer is a big . . . business-managed operation that knows modern marketing methods and up-to-date merchandising trends. All the way from the crude oil sources . . . through the refineries . . . laboratories and smoothly functioning distribution system . . . one keynote is paramount. *The right product at the right time . . . in the hands of the right dealer.*

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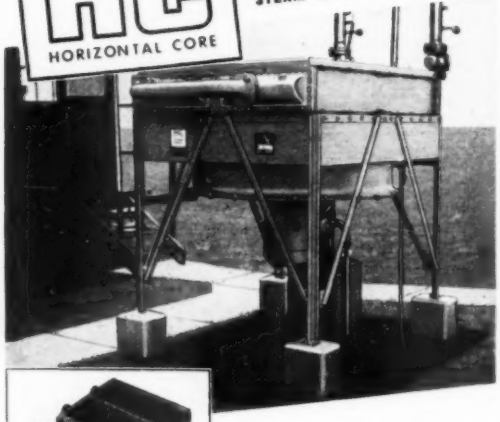
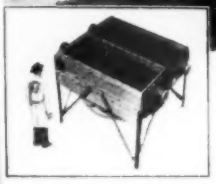
QUALITY PETROLEUM PRODUCTS

YOUNG "HC" HORIZONTAL CORE

ECONOMY PLUS VERSATILITY IN

WATER, OIL, GAS COOLING... STEAM & VAPOR CONDENSING





Basic "HC" Unit may be used in multiples for greater cooling capacity or combination of services.

IMPORTANT FACTS ABOUT THE "HC"

- LOW COST—small initial investment, economical maintenance.
- VERTICAL AIR DISCHARGE—eliminates cross wind effects.
- HIGHLY EFFICIENT—airfoil section fan.
- MULTIPLE INSTALLATIONS—provide greater capacity, combined services.
- NO VIBRATION—adjustable pitch fan mounted separately from unit.
- LARGE CAPACITY—water cooling, from 600,000 Btu/hr up; oil cooling, from 20,000 Btu/hr up.
- LOW HP REQUIREMENT—1 to 10 hp per fan.
- EASY INSTALLATION—simplified piping and frame construction.
- CORE GUARD SCREEN—protects cores from falling objects.

• Here is another development by Young providing high efficiency cooling and condensing at low initial and operating costs. The Dual coil "HC" is designed for water and lube oil cooling. Manifolds are available for all types of coils. Four sizes, with 2, 4, 6 and 8 coil installations, provide exceptional versatility in heat transfer service. The 4 or 6 blade fan, serving each two coil unit, may be mounted directly on the fan motor shaft, or powered by a v-belt or gear speed reducer drive. Full details about the new "HC" Units, or other Young Heat Transfer Products, are available on request.

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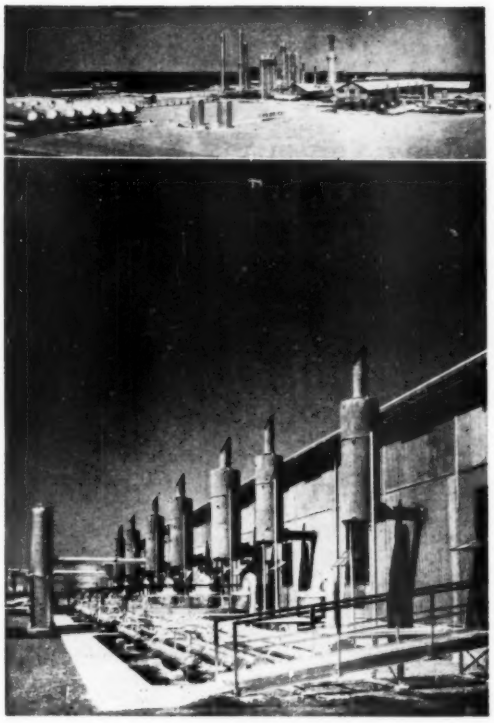

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The Maxim Silencers shown above are used on the exhaust of large gas compressor units at the Pettus Cycling Plant of the Stanolind Oil & Gas Company at Pettus, Texas.

In case after case where you find an important project of this kind, you will also find that Maxim Silencers have been chosen to insure the most efficient silencing of exhaust noise.

Maxim's longer experience in the silencing field, backed by Maxim's progressive research and engineering staff, brings to each silencing problem the kind of specialized attention that means "more for your money." It's just common sense to "be sure it's a Maxim."

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REFINING

Big Storage Project

WICHITA. — Construction projects which will add 9,870,000 gal. of storage capacity at two marine terminals have been announced by Wood River Oil & Refining Co.

A 1,470,000-gal. tank was scheduled for completion this week at the firm's Nashville terminal, which will bring total capacity of the terminal to 3,645,000 gal.

Work is to begin soon on two tanks totaling 8,400,000 gal. at Wood River's St. Paul terminal. When completed, the new tankage will give the terminal a total capacity of 19,740,000 gal.

All terminals are supplied by barge from the firm's Hartford, Ill., refinery, with exception of the Rockford, Ill., terminal. It is served by a company pipe line from Peru, Ill.

Plan New Cat Cracker

NEW ORLEANS.—Contract has been signed between Pan-Am Southern Corp. and Foster Wheeler Corp. for construction of a second fluid catalytic cracking and vapor recovery unit at Pan-Am's El Dorado, Ark., refinery.

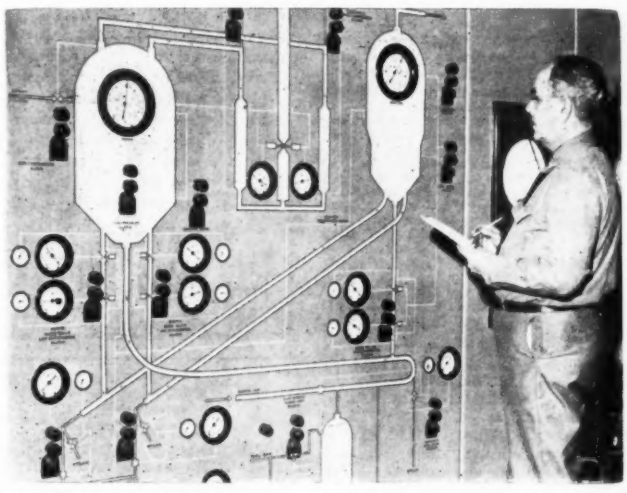
R. T. Colquette, general manager of Pan-Am, said that construction of these facilities is a major step in a large construction program at the refinery to expand operations for increased crude capacity and improved product quality.

Last September it was announced that a new coking unit was started and this unit is approximately 35 per cent erected with completion scheduled for September.

The new catalytic cracking facilities will process 9,000 bbl. a day of gas oil to high octane gasoline and furnace oil. These facilities, together with the coking unit now under construction, will increase the refinery crude capacity about 20 per cent or to 30,000 bbl. a day and permit production of 16,500 bbl. daily of motor gasoline.

Lube Production Up

TULSA.—Production of lubricating oils in the Mid-Continent area rose sharply in February, as well as shipments of the product, Western Petro-



OIL PROCESS EXPLAINED.—This graphic instrument panel represents the "heart" of the control board of the new 40,000 bbl. daily fluid catalytic cracking unit at the Bayway refinery of Esso Standard Oil Co. in Linden, N. J., which produces more than 1,000,000 gal. of gasoline and 250,000 gal. of heating oil daily. While illustrating flow of material through the unit and the function of its various dials and instruments, the graphics do not interfere with the routine use of instruments in regular operations. A stillman is shown taking hourly readings. Besides the instruments which indicate pressure and temperature at critical points in the cat cracker, the panel includes warning signals for danger limits in catalyst levels, pressures, and temperatures.

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leum Refiners Association reported last week.

Stocks of lubricating oils registered a slight decline, however. The report was based on 14 reporting companies. Comparable figures a year ago were based on reports from 13 companies.

Production amounted to 1,245,815 bbl. during February, an increase of 268,862 bbl., or 27.6 per cent over the same month in 1949. Shipments, domestic and export, rose 207,328 bbl., or 22.1 per cent to a total of 1,146,314 bbl. Domestic shipments rose sharply to 72,201 bbl., or a gain of 51,040 bbl. or 241.2 per cent over February a year ago.

Stocks of lube oil on hand at the end of February totaled 1,758,390 bbl., an increase of 6,618 bbl., or 0.4 per cent from a year earlier.

Aviation-Gasoline Report

BARTLESVILLE, Okla.—The U. S. Bureau of Mines has issued a report of investigations on commercial aviation-gasoline production. Compiled by O. C. Blade, the report, No. 4,664, is entitled: "National Annual Survey of Commercial Gasoline, October 1949 Production."

Commercial aviation gasolines produced during that month had the following octane numbers, according to the report:

Grade	Lean mixture rating Octane No.*	Rich mixture rating Octane No.*
80	81.1	87.6
91/98	92.8	98.9
100/130	Isooctane + 0.14 ml. TEL (105 performance No.)	Isooctane + 1.33 ml. TEL (131 performance No.)
115/145	Isooctane + 0.57 ml. TEL (117 performance No.)	Isooctane + 2.93 ml. TEL (146 performance No.)

*These octane values should not be confused with the motor and research-method octane numbers of motor gasolines. The respective knock-rating tests are conducted with equipment designed for the conditions of use. An aviation gasoline tested by the motor method would have a higher octane number.

These values do not show significant differences from average ratings of commercial aviation gasolines produced in January 1949 and several preceding years.

Other properties of these fuels, such as Reid vapor pressure and distillation temperatures, also show little variation compared with fuels tested in surveys of January 1949 and July 1948 production. The average Reid vapor pressures for the four grades were 6.2, 6.4, 6.7, and 6.8 lb., respectively.

Chemical Conclave Set

NEW YORK.—Fuel, gas, and petroleum chemistry will play an important part in the twelfth International Congress of Pure and Applied Chemistry which convenes in New York City in September 1951. At the same time, the American Chemical Society will celebrate its seventy-fifth anniversary.

The 1951 conclave is expected to attract the largest number of chemists and chemical engineers ever to attend the quadrennial congress. Chemical societies in Canada and eight Latin American countries are collaborating with the National Research Council in plans for the meeting.

Among subjects to be discussed by petroleum groups are: synthetic petroleum from coal and gas, shale oil, petroleum additives, antioxidants, asphalt, lubricants, coal, and motor, jet, and rocket fuels. Chemists of all nations are invited to attend and to present papers.

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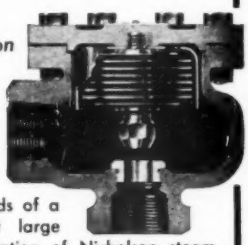

Records of a recent large installation of Nicholson steam traps show they cut processing time 30%. They are keeping equipment full of live steam because: operate on lowest temperature differential; have 2 to 6 times average drainage capacity. 5 types for every process, power, heat purpose; size ¼" to 2", press. to 225 lbs.

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A typical Marlow Self-Priming Centrifugal engine driven model for portable applications.

An electric motor driven Marlow . . . . ideal for stationary installations.

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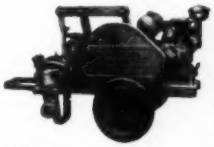

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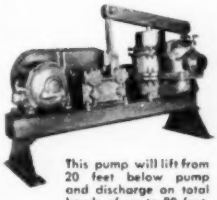
The rugged Marlow walking Plunger Pump is fitted with metal plunger instead of diaphragm. With same basic features as the diaphragm pump, well suited to indefinitely sustained pumping for removing heavy sludge, residues, recirculation, for tank bottom disposal and other heavy jobs. Sizes 3- and 4-inch single; 60 to 90 GPM. Gasoline engine or electric driven, portable or stationary mounting.



This pump will lift from 20 feet below pump and discharge on total heads of up to 80 feet.

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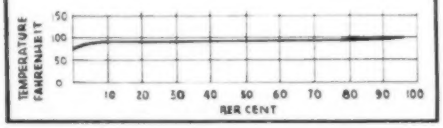

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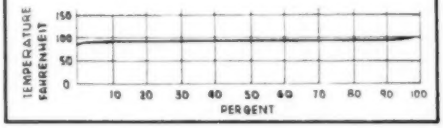
Distillation Curve



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NATURAL GAS

New England Hearing

WASHINGTON. — A hearing will convene in Boston May 8 before Federal Power Commission on application of Northeastern Gas Transmission Co. for authorization to construct a 545-mile natural-gas pipe-line system in New England.

The Northeastern proposal is part of a consolidated proceeding, now in progress, involving several applications which also include plans for gas service in New York State. Northeastern is proposing to construct the line for transportation and sale of gas at wholesale in the New England states. In addition, the proceedings involve applications of Tennessee Gas Transmission Co. and Transcontinental Gas Pipe Line Corp., which would supply Northeastern's gas requirements.

Also included in the proceedings are applications by New York State Natural Gas Corp., and Niagara Mohawk Power Corp., which would build pipe-line facilities in New York State; and East Tennessee Natural Gas Co., which has asked to have its application separated from the proceedings.

El Paso Seeks Increase

WASHINGTON.—El Paso Natural Gas Co. is proposing construction, acquisition, and transfer of natural-gas pipe-line facilities in order to increase its deliveries of gas to Phoenix, Ariz., by 35,000,000 cu. ft. daily.

A shortage of at least 35,000,000 cu. ft. of gas daily in Phoenix is claimed in the application. El Paso has contracts to obtain that additional amount from flare-gas producers in the Permian basin area.

The company has asked Federal Power Commission to authorize: (1) construction of 34.2 miles of line and several metering and regulating stations; (2) construction of 10.3 miles of line in Phoenix for transfer to Central Arizona Light & Power Co.; (3) abandonment of several city-gate stations in and near Phoenix; (4) to transfer 24.6 miles of existing line in the area to Central Arizona Light & Power; and (5) to acquire 11.9 miles of line in Maricopa County from the Central Arizona company.

Gas Line Proposed

WASHINGTON. — Georgia Natural Gas Co., Albany, Ga., is seeking to construct a 335-mile pipe-line which would serve natural-gas markets in southwestern Georgia, and the city of Tallahassee, Fla.

The firm has applied to Federal Power Commission for authorization to build the transmission system, which will cost $4,872,593. It would connect with Southern Natural Gas Co.'s line near Phoenix City, Ala., and extend on to Tallahassee, with laterals or branch lines serving the principal cities and towns in Southwest Georgia, adjacent to the proposed line.

Georgia Natural is also seeking an FPC order directing Southern Natural to provide and sell an adequate gas supply for the proposed line. Estimates of its annual demand have been set at 9,167,098,000 cu. ft., with an estimated maximum day, firm, of 30,000,000 cu. ft.

The company stated that its application is not intended to be competitive with the application of Atlantic Gulf Gas Co., which is seeking permission to build pipe-line facilities which would carry gas to Georgia, Florida, South Carolina, and Alabama, but is an alternative proposal in the event that a certificate is not issued to Atlantic Gulf, Georgia Natural said.

New Carbon-Black Plants

Continental Carbon Co. and Witco Chemical Co. will construct four new furnace black plants somewhere in the Southwest. These new installations will produce high-abrasion furnace black similar to the HAF black now produced at Witco's Sunray, Tex., plant.

The four plants will increase the companies' carbon-black production four-fold, it was announced. Decisions are believed imminent as to plant locations and contracts for natural gas.

New Rates Effective

WASHINGTON. — Ohio Fuel Gas Co.'s proposed increase in rates for wholesale natural-gas service has become effective as of April 1, subject to further Federal Power Commission order, provided the firm executes a $100,000 bond satisfactory to FPC within 15 days.

The proposed increase, which would amount to approximately $726,331 annually based on the 12-month period ending September 30, 1949, was suspended by FPC in August, pending hearing and decision on the question of the lawfulness of the rates.

In another application before FPC, Northern Natural Gas Co. has asked for an increase in its wholesale rate to 28 gas-utility customers, which would amount to $3,200,000 annually for the 12-month period ending October 27, 1950. Increases in costs, including labor, materials, and supplies, as well as constructing facilities to provide necessary additional capacity, was stated the reasons for seeking the rate increase. Northern Natural proposes to make the new rate effective April 27 and this is now under FPC study.

Decision Appears Near

WASHINGTON.—Federal Power Commission's decision on proceedings involving joint application of Independent Natural Gas Co. and Northern Natural Gas Co. appears near, since the commission has ordered intermediate decision procedure omitted.

Independent is proposing to abandon and sell, and Northern Natural is proposing to acquire and operate, a compressor station in Gray County, Texas, and a 21-mile pipe line extending from the station to a connection with Northern's facilities in Carson County, Texas.

Proposed transaction would permit Northern Natural to purchase gas directly from Phillips Petroleum Co.

Sales Plans Discussed

PITTSBURGH.—Problems confronting the sales division of the natural-gas industry were discussed at a 2-day meeting of the Eastern Natural Gas Regional Sales Council which was held at the William Penn here April 17-18.

Chairman James E. Humphreys, Ohio Fuel Gas Co., was in charge. Among topics discussed were the many selling problems which must be solved if the industry is to capture its share of the consumer dollar; marketing plans of various gas-appliance manufacturers, and industrial relations.

Natural Gasoline

Gasoline Plant Operating

RANKIN, Tex.—Completion of a natural-gasoline plant near here to process the gas produced from the Benedum field in Upton and Reagan counties, Texas, has been announced by John T. Oxley, president of Texas Natural Gasoline Corp. This plant, located 17 miles northeast of Rankin, recently began full operations. It was constructed jointly by Texas Natural and Upton Gas Products Co., and is being operated by Texas Natural.

The Benedum plant capacity is 55,000,000 cu. ft. of gas daily, with a recoverable production of 200,000 gal. of natural gasoline and liquefied petroleum gas. Residue gas is being sold to El Paso Natural Gas Co., El Paso.

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Exploration and Drilling

Why Independents Find Some Fields

IN a recent talk before geophysical students at one of our universities by a man universally recognized as an outstanding geophysicist, the speaker let drop one sage observation that makes sense to many exploration men.

This man has long been an outspoken advocate for much closer cooperation between geologist and geophysicist, right down at the operating level. He has consistently pointed out to both that in many, many cases the geophysicist, from his instrument observations, could not offer a single, exclusive explanation of what might be causing an anomaly. But, as he repeatedly points out, the geophysicist can rule out as impossible, many possible explanations that occur to the geologist. On the other hand, the geologist can absolutely rule out several possible explanations of the geophysicist.-By a process of mutual thrashing out of various possibilities across the table, they can eliminate all but a few that will satisfy both the geological and the geophysical observed conditions.

To the students, he pointed out a similarity between this and the problem of a detective in solving a murder. Given only one clue, the detective has a large group of suspects, any one of whom this clue would fit. When the detective gets two clues, some of his suspects automatically get eliminated from consideration. A third clue will usually eliminate some more, and so it goes. The more clues he gets, the more suspects are eliminated because they don't fit all the evidence about times, places, opportunities, or motives.

Given a problem in picking a possible oil-producing area, the same thing holds. A magnetic survey, alone, leaves a whole host of possible explanations for an anomaly. Followed by a gravity survey, the possible explanations are reduced in number. Considerations of the known geological factors compared to the reduced number of geophysical possibilities, will still further narrow the number of possible explanations. Seismic work on top of all the others ought to narrow the field of possible explanations very decidedly.

Well, everyone knows this — at least they know it theoretically. What has this got to do with independents finding oil fields that majors miss? Just this. In practice, an independent quite often does just exactly what theoretically the majors should do, but frequently don't.

An independent, particularly one with geological or geophysical background, will often get a hunch about a certain area. What does he do? He gets all the well logs, sometimes samples, and he studies every scrap of that evidence he can lay his hands on. Then he gets hold of any geophysical maps he can find. He studies them all to test his hunch. He will, if possible, talk to both geologists and geophysicists who have worked in the area. He will have some definite questions to ask, and he will have some general ideas he wants to check. Often, as we all know, he will talk to the driller who worked on some wells in the area.

Checking every scrap of evidence, geophysical and geological, he proves, disproves, or modifies his hunch. He follows the detective method, and by means of checking each clue against all the other clues, he eliminates and eliminates. By that time he certainly knows many things that couldn't possibly have happened in the area, and he knows some things that conceivably could have happened. If it still looks good, he promotes a deal, and often opens a new field that majors have missed.

Why didn't the major do this? Mainly because half a dozen specialists work on various angles, made their separate reports, and went on to other special jobs. No one man got them all together and by constant cross-checking of the possible theories, found the one or two explanations that all could agree were possible and consistent with their specialized data.

It is the old story; the big company with lots of specialists has lots of advantages, but the little fellow who uses his brains and works hard, can still do things the big company can't do. The public and the industry benefit, because more oil fields are found. *Charles J. Deegan.*

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

WEST TEXAS.—General Crude Oil Co. 1-A Percy Jones, NE NE Section 79, flowed 206.8 bbl. of 38°-gravity oil in 13 hours, through ¼-in. choke from open hole at 6,742-51 ft., for a daily potential of 384 bbl. The flow was without acid. Caroline Hunt Trust 1 J. W. Young, northwest of Clairemont, backed up the hole and completed for 2,184 bbl. of oil daily. In Cogdell field, J. A. Chapman 6 Cogdell (an extension to the field) had a new pay in the lower Permian or upper Pennsylvanian, which flowed oil on drill-stem test.

ROCKY MOUNTAIN AREA.—Trigood Oil Co.-Hamm Brewing Co. found a show of gas in the top of Frontier at their deep McCullough Peak, Wyoming, wildcat and are drilling ahead in that formation. At Happy Springs, Wyoming, Sinclair Oil & Gas Co. tested water in the Tensleep at 10,034 ft., total depth, and plugged back for further tests of upper zones. At Armstrong, Colorado, British-American Oil Producing Co. is preparing to test shows in the Muddy and Dakota sands with the well now in the Morrison at 5,800 ft., total depth.

MISSISSIPPI.—Pan American Production Co. completed 1 S. J. Holloway, Jr., SW NW 23-6n-6e, as the discovery well of West Lincoln field, Lincoln County. Through perforations at 10,646-84 ft., in the lower Tuscaloosa "stringer" sand, the well flowed 154 bbl. of 41.5°-gravity oil daily through a 10/64-in. choke on potential test. Tubing pressure was 700 psi. In Adams County, Humble Oil & Refining Co. has completed the 1 Lucy E. Barksdale, 26-5n-3w, for a new Wilcox discovery. Through perforations at 6,571-73 ft., and on 20-hour gage, the well flowed 143 bbl. of 41.8°-gravity oil through a ⅛-in. choke. Tubing pressure was 620 psi. and casing pressure was 700 psi.

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Incorporates all the important features of the regular UNBRAKO Pressure Plug, including fully formed threads, uniform taper and perfect roundness.

A full range of sizes from 1/16" to 1¼", National Pipe Thread Fuel, is available. Full details are given in Bulletin 675.

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Lyon County Discovery Swabs 20 Bbl. Per Hour

SWABBING tests at Stanolind Oil & Gas Co. and Winkler-Koch Engineering Co. 1 Cornwell, NE NE NE 26-16-10e, northwestern Lyon County wildcat, virtually have assured the completion of a good producer and opening, already indicated by showings in previously reported drill-stem tests, of another pool for the Forest City basin, in the northeastern part of the state.

Cleaned out to total depth of 2,967 ft. in Hunton lime, topped at 2,950 ft. (—1,603 ft.), and on which 5½-in. oil-string had been cemented, the hole filled 2,000 ft. of clean oil, 1,200 ft. of which was in the first hour. Swabbing from 800 ft. off bottom, the well produced at the rate of 20 bbl. of approximately 34° oil per hour.

Located about 17 miles southeast of the prolific, Viola-lime Davis Ranch pool, Wabaunsee County, which Carter Oil Co. opened about a year ago, the new discovery is near the southern edge of the basin.

About 11 miles further south in the SW SW NW 23-18-10e, same county, Ray Anderson and associates are preparing to test oil showings encountered in the Lansing-Kansas City lime at their 1 Ball. This wildcat is a south offset to a well drilled last September by J. M. Huber Corp. which also found good showings in the same pay but failed to make a commercial producer when tested. It topped the Lansing at 1,265 ft. (—20 ft.) and drilled to 1,612 ft. with 7-in. casing at 1,590 ft. in the Kansas City lime, topped at 1,387 ft. (—142 ft.). The Huber well tested with perforations in the Lansing at 1,603-11 ft. It had the top of the Lansing at 1,261 ft. (—19 ft.)

Testing is under way at Adair Oil Co. and associates 1 Hammeke, NW NW NW 17-19-11, promising discovery well located 3 miles north of Ellinwood, Barton County. Latest reported tests were with casing perforated at 3,086-94 ft. and 3,062-70 ft. in the Lansing-Kansas City, topped at 3,065 ft. (—1,290 ft.), and in which the well swabbed at the rate of 6 bbl. of oil per hour before acidizing. It previously had tested zones in the Lansing-Kansas City at 3,228-36 ft. and 3,204-12 ft. and 3,158-66 ft. Before plugging back to the Lansing-Kansas City, it tested water in the Arbuckle at 3,370-3,410 ft. The discovery is about a mile southwest of the St. Peter pool, and about 2 miles southeast of the Cheyenne View pool.

Yellow Cab Co. 1 Boyle, SE SW SE 17-17-14, which opens a new producing area ¾ mile northwest of the Carroll pool, northern Barton County, established a pumping potential at 321 bbl. of oil per day. Production is from Arbuckle lime, open at 3,402-08 ft.

Westgate-Greenland Oil Co. 1 Smith, NE NE NW 5-10-21, a new discovery located 3 miles southwest of the Morel pool in southwestern Graham County, swabbed 60 bbl. of oil in 3 hours while testing Arbuckle lime at a total depth of 3,822 ft. Casing is at 3,818 ft., 2 ft. in the pay, topped at 3,816 ft. (—1,558 ft.). Location has been made for a north offset, 1 Denning, SE SE SW 32-9-21.

This company's 1 Doran, SE NE NE 14-21-13, another discovery well located a mile east of the Rothgarn pool, 5 miles northeast of Seward, north central Stafford County, has been completed with a potential of 186 bbl. of oil per day. Pay zone also is the Arbuckle at 3,544-53 ft. (—1,677-88 ft.).

Extension of the Southeast Palco pool, Rooks County, a half mile south is virtually assured at Heathman Drilling Co. 1 Williams, NW NW NW 16-10-20, which swabbed at the rate of 15 bbl. of oil per hour following a 500-gal. acid treatment of the pay zone. Total depth is 3,821 ft. in Arbuckle lime, topped at 3,815 ft. (—1,571 ft.), and in which casing was run to 3,817 ft.

KANSAS WILDCAT FAILURES

Brown County: Davon Oil Corp. 1 Yost, SE SW NE 33-1s-16e, dry, TD 3,425 ft., Howard 471 ft., Topeka 515 ft., Mississippi chat 2,336 ft., Kinderhook 2,517 ft., Hunton 2,751 ft., Viola 3,372 ft.

Ellis County: Anschutz Drilling Co. 1 Weigel, C S 2 SE SE 2-12s-19w, dry, TD 3,735 ft., anhydrite 1,440 ft., Hoxbar 3,353 ft., Toronto 3,373 ft., Lansing 3,395 ft., conglomerate 3,679 ft., Arbuckle 3,700 ft.

Jones-Shelburne & Farmer 1 Hoffman, NE NE SE 8-14s-17w, dry, TD 3,632 ft., anhydrite 1,220 ft., Hoxbar 3,284 ft., Toronto 3,306 ft., Lansing 3,327 ft., Arbuckle 3,562 ft.

M. B. Armer 1 Rajewski, SE SE NW 28-14s-16w, dry, TD 3,475 ft., anhydrite 1,010 ft., Hoxbar 3,119 ft., Toronto 3,139 ft., Kansas City 3,168 ft., conglomerate 3,411 ft., Arbuckle 3,434 ft.

Greenwood County: Polhamus 1 Barrier, NE SW NE 16-25s-9e, dry, TD 2,333 ft., no tops reported.

W. Glasco 1 Jake Glasco, SW NE SW 11-28s-10e, dry, TD 4,150 ft., no tops reported.

Lyon County: Willingham 1 Brockhouse, SE SE NE 28-19s-10e, dry, TD 2,790 ft., Lansing 1,220 ft., Kansas City 1,445 (?) ft., Mississippian 2,184 ft., Kinderhook 2,467 ft., Hunton 2,617 ft., Viola 2,627 ft., St. Peter 2,711 ft., Arbuckle 2,763 ft.

McPherson County: Lawrence & Bush 1 Sterling, SW SW SW 3-19s-1w, dry, TD 3,565 ft., Kansas City 2,311 ft., Mississippian 2,895 ft., Viola 3,417 ft., Arbuckle 3,522 ft.

Pratt County: Rine Drilling Co. 1 Rosenbaum, SW SW SW 3-28s-12w, dry, TD 4,610 ft., Lansing 3,720 ft., Mississippian 4,172 ft., Viola 4,361 ft., Simpson 4,454 ft., Simpson sand 4,460 ft., Kinderhook 4,290 ft., Arbuckle 4,558 ft.

Russell County: B & R Drilling Co. 1 Dumler, SE SE NW 28-15s-15w, dry, TD 3,490 ft., anhydrite 940 ft., Lansing 3,137 ft.

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conglomerate 3,370 ft., chert 3,399 ft., Arbuckle 3,466 ft.

Sedgwick County: J. P. Gaty 1 Borg, SE SW NE 25-26s-2e, dry, TD 3,283 ft., Kansas City 2,394 ft., Mississippian 2,869 ft., Kinderhook 3,121 ft., Viola 3,161 ft.

George Martin and Russell Cobb 1 Wise, SW SW NE 36-28s-2w, dry, TD 3,925 ft., Kansas City 2,920 ft., Mississippian 3,502 ft., Kinderhook 3,759 ft., Viola 3,805 ft., Simpson 3,807 ft., Arbuckle 3,890 ft.

Stafford County: Harper & Parrish et al 1 Delker, NE NE NE 3-24s-13w, dry, TD 3,983 ft., anhydrite 755 ft., Hoxbar 3,346 ft., lime 3,378 ft., Lansing 3,507 ft., Viola 3,841 ft., Simpson 3,899 ft., Arbuckle 3,963 ft.

TEXAS GULF COAST

Sun Completes Discovery Northeast of Delhi Field

HOUSTON.—Sun Oil Co. has completed the 1 Williamson for a new discovery 1½ miles northeast of North Delhi field, Harris County. The well flowed 21 bbl. of 41.8°-gravity oil daily through perforations at 6,486-89 ft. using ¼-in. choke. Tubing pressure on the completion was 360 psi. The new pool is located in H&TC Survey 19, Abstract 428, 7 miles southwest of Cypress.

Six miles southeast of Stratton, DeWitt County, Shell Oil Co. is completing the 1 Hubert Heaton for a new discovery well. Drilled to a depth of 9,000 ft., the well was perforated at 7,727-50 ft. and tested 7,700,000 cu. ft. of gas daily through a ⅛-in. choke with tubing pressure of 1,650 psi. The new producer is in the Thomas Barry Survey, Abstract 82.

Western Natural Gas Co. has completed the 1 Great Southern Life Insurance Co. for a gas discovery in the Simmons Subdivision, Block 51, 3½ miles northeast of the Clayton field, Live Oak County. The well was drilled to a depth of 6,940 ft. and 7-in. casing set at 6,518 ft. Completion was made through perforations at 6,427-36 ft., but no gage has been made on the well.

In the New Ulm area of Austin County, McCarthy Oil & Gas Corp. 1 Herman Blezinger flowed 271 bbl. of 40.2°-gravity oil daily through perforations at 8,978-88 ft. Tubing pressure was 500 psi. Through perforations at 9,328-40 ft., a sand which has never been tested in that field, the well flowed 25,000,000 cu. ft. of gas daily on open-flow potential, plus 60.3 bbl. of 50°-gravity condensate per million cu. ft. of gas. This well is located 3,800 ft. northeast of present production in the New Ulm area.

The 63 new locations include 13 wildcat starts, 1 each in DeWitt, Goliad, Victoria, Fort Bend, Harris, and Polk counties, 2 each in Montgomery and Wharton counties, and 3 in Live Oak County. There were seven successful exploratory wells completed, one each in Jackson, Karnes, Live Oak, Victoria, Harris, Liberty, and Orange counties, while four were dry, one each in Calhoun, Hardin, Jefferson, and Liberty counties.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCATS

Harris County: Oil discovery—Sun Oil Co. 1 Williamson, H&TC Sur. 19, A-428, 7 mi. SW of Cypress, TD 7,765 ft., top sand 6,486 ft., perf. 6,486-89 ft., IP: 20 bbl. oil per day, 8/64-in. choke, TP 360 psi., 41.8° gravity.

Jackson County: Gas discovery—Southern Minerals 1 G. T. Brooking et ux, Josiah H. Bell Sur., A-7, 4 mi. SE of Vanderbilt field, dual completion: TD 9,027 ft., perf. 6,848-52 ft., IP: 5,800,000 cu. ft. of gas daily on open flow, SITP 2,550 psi., perf. 6,003-33 ft., IP: 15,000,000 cu. ft. of gas on open flow, SICP 2,290 psi.

Karnes County: New oil pool—Edwin B. Cox and Jake Hamon 1 A. & L. Schoore, Victor Blanco Sur., A-3 with San Antonio River, 3 mi. SW of Runge, top pay 6,494 ft., TD 6,762 ft., perf. 6,545-46 ft., IP: 139 bbl. oil per day, ½-in. choke, TP 1,600 psi., 37.2° gravity.

Liberty County: New pay at South Liberty—L. M. Josey et al 17 Joseph Mitchell, M. G. White Sur., TD 6,508 ft., top pay 5,880 ft., perf. 5,880-914 ft., IP: 232 bbl. oil per day, ¼-in. choke, TP 975 psi., CP 1,225 psi., 37° gravity.

Live Oak County: Gas discovery—Western Natural Gas Co. 1 Great Southern Life Insurance Co., Simmons Subdivision, 2½ mi. SE of Simmons City, top pay 6,427 ft. (Slick), TD 6,940 ft., perf. 6,427-36 ft., IP: no gage, shut in

Orange County: New pay at Port Neches—The Texas Co. 4 Polk-Kuhn-Glass, T. J. Notgrass Sur., TD 3,075 ft., top pay 6,011 ft., perf. 6,023-27 ft., IP: 164 bbl. oil per day, 6/64-in. choke, TP 800 psi., 31.6° gravity.

Victoria County: New pay at Placedo (Old) J. & C. Drilling Co. 5 Agnes West, W. Rupley Sur., TD 6,055 ft., perf. 5,559-62 ft., IP: 165 bbl. oil per day, ⅛-in. choke, TP 1,150 psi., gravity 30.1°, dual completion, top pay 5,444 ft., perf. 5,443-46 ft. (new sand), IP: 144 bbl. oil per day, 9/64-in. choke, CP 890 psi., 28° gravity.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Calhoun County: C. G. Glasscock & Pontiac Refining Corp. 1 Geo. O. & M. J Duncan, John C. Post Sur., A-133, 1 mi. SE of East Long Mott field, 8 mi. SW of Port Lavaca, dry, TD 9,395 ft.

Hardin County: Goldston Oil Corp. 1 Minor Oil Co., Sour Lake Dome, S. Jackson Sur., dry, TD 5,404 ft.

Jefferson County: Sam Maceo Oil Operations 1 Dishman-Lucas, Wm. McFarland Sur., 6 mi. S of Nome, dry, TD 6,963 ft.

Liberty County: Hinkle Drilling Co. 1 R. H

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Munger et al, Moss Bluff area, J. McFaddin Sur., A-76, 3 mi. N of Wallisville, dry, TD 6,029 ft.

EASTERN TEXAS

Rodessa Test Has Series Of Scattered Gas Shows

DALLAS.—Sells Petroleum Co. 1 Oliver Hackett, Rodessa test between Red Springs and Sand Flat fields of Smith County, in Samuel Leeper Survey, cored shale with no shows from 9,337-68 ft. A 2-hour drill-stem test from packer at 9,310 ft. and 9,337 ft., total depth, produced a light blow, which died in 45 minutes, then returned in 1 hour to build up a strong blow. Recovery was 160 ft. of gas-cut mud.

The Rodessa section was topped at 9,041 ft., on elevation of 446 ft., and cores throughout the section had scattered oil shows. Most of the zone, it was said, lacked sufficient porosity and permeability.

The well's most promising test was from 9,245-67 ft., where it produced a strong blow and recovered 216 ft. of 42°-gravity oil, and 2,013 ft. of gas-cut water cuhion, with no mud or formation water.

A second operation was in the planning stage in the new Paluxy area opened 2 miles south of Tyler by Bobby Manziel 1 Campbell. Operations were to start soon at R. J. Caraway and Delta Drilling Co. 1 Thomas B. Ramey, located 2,600 ft. northeast of the Manziel discovery on a 37.9-acre lease in R. Fletcher Survey.

Sinclair Oil & Gas Co. 1 Tommie Lukenbill, John C. Robertson Survey, A-819, a northeast extension try for the two-well Bud Lee field of Smith County, topped the Paluxy at 7,510 ft., on elevation of 600 ft. A 30-minute test from 7,594-7,621 ft. recovered 90 ft. of oil, plus the water cushion.

EAST TEXAS (DISTRICTS 5, 6 AND 6-P) WILDCAT FAILURE

Leon County: Danciger Oil & Refining Co. 1 J. B. Knight, Simon Sanchez Sur., A-25, 8 mi. E Oakwood, dry, TD 5,800 ft., elev. 210 ft., base Austin 5,403 ft., top Woodbine 5,700 ft., in sub-Clarksville 5,454 ft., by samples.

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CALIFORNIA

Interest Continues in Cuyama Valley Wildcats

LOS ANGELES.—Wildcatting activity in the Cuyama Valley area continues to hold interest of most California operators. Three wildcats there are well under way, four more are planned, and three confirmation tests have been started to evaluate the recent Superior discovery northwest of Russell Ranch field.

About ½ mile southwest of the Superior discovery, Hancock Oil Co. 65-10 Hancock-Oceanic apparently established the field's limits in that direction. At around 2,400 ft. the well drilled into the Cretaceous, finding the sands missing which produced in Superior's 6,100-ft. discovery. From total depth of 2,422 ft., however, the well has been plugged back to test oil sands at about 1,710 ft. These sands, in the Morales which was encountered from 1,695 to 1,[illegible]0 ft., showed good oil possibilities on an earlier drill-stem test.

Superior has a north offset, No. 17-2, under way, and to the southwest of the discovery Southern California Corp. was drilling below 800 ft. at its 81-1-Shlaudeman. Some 5 miles northwest, Universal Consolidated Oil Co. was drilling in shales below 6,630 ft.

About 1½ miles southwest of Russell Ranch, Richfield Oil Corp. has staked location for its 25-10 Russell-A, in Section 10-10n-27w. About 2 miles south of present production, in Section 18-9n-26w, J. H. Mauer and A. C. Fisher plan to drill a test; also they have staked two wildcats to the northeast of Russell Ranch, one in Section 34 and the other in Section 36-11n-26w.

In eastern Cuyama, in Kern County, two wildcats are being closely watched. In Section 20-10n-24w, The Texas Co. 1 Stubblefield-Fickle was drilling and spot coring below 3,035 ft. One mile south in Section 29, Independent Exploration Co. at last report was below 1,700 ft. at its 71-29 Stubblefield.

In San Miguelito field of Ventura County, Coastal California, Continental Oil Co. last week was continuing to test slight shows of oil in its deep test, 65-E Grubb. With hole carried to total depth of 16,727 ft., 6⅝-in. casing has been set at 14,626 ft. with 4½-in. liner landed at 15,775 ft. Some 20 ft. of section was gun perforated above 14,740 ft. and on a 4-hour test some gas-cut and oil-spotted mud was recovered. At last reports a section at about 14,556 ft. had been perforated and a formation test being made. Location is in Section 25-3n-24w.

North of the Continental deep test, on Rancho Santa Ana in Section 19-4n-23w, Bankline Oil Co. is below 2,500 ft. at its 1 F. G. Dunshee. Objective is an Eocene sand, expected somewhere about 5,000 ft.

Bolsa Chica Oil Corp. has staked 43-18 Kinler as a stepout to a small producer recently completed in the Castaic area of Los Angeles County. Located in Section 18-5n-16w, the test will be approximately ¼ mile south of T. & M. Exploration Co. 1 Kinler. This well was completed late last month for a small producer at about 2,000 ft.

In the extreme southern part of Los Angeles County, General Petroleum Corp. has

staked location for a wildcat on the McNally Ranch. Location, in Section 22-3s-11w, is about 1 mile southeast of its 1 Librown which was completed for a small producer in 1946 and later abandoned.

CALIFORNIA SUCCESSFUL WILDCAT

San Luis Obispo County, Cuyama Valley area: Superior Oil Co. 18-2 Government, 2-11n-28w, 3 mi. NW Russell Ranch field, TD 6,126 ft., flowed 450 bbl. of 38.1°-gravity oil a day through perforations at 5,635-6,105 ft., elev. 3,100 ft.

CALIFORNIA WILDCAT FAILURES

Kern County, Tejon Flats area: Fickle & Wattenbarger 2 Wattenbarger, 15-11n-18w, dry, TD 494 ft., elev. 1,046 ft.

Santa Barbara County, Cuyama Valley area: Douglas Oil Co. of Calif. 85-16 Cuyama, 16-9n-26w, dry, Miocene 5,310 ft., TD 6,956 ft., elev 3,020 ft.

Solvang area: Ohio Oil Co. 1 Alisal Ranch, 5-5n-31w, dry, TD 2,819 ft., elev. 990 ft.

San Benito County, Ciervo area: Fairview Exploration Co. 1 Fairview-Panoche, 33-15s-11e, dry, TD 1,258 ft., elev. 1,092 ft.

SOUTHWEST TEXAS

Large Producer Completed On Pump by The Texas Co.

CORPUS CHRISTI.—On the west edge of Darst Creek field, Guadalupe County, The Texas Co. has completed the A-9 Christopher Knobloch for a very large oil producer on a pump. Through perforations from 2,581-87 ft., the well pumped 524 bbl. of 37.1°-gravity oil daily plus 461 bbl. of salt water. The well, located in Joel H. Robinson Survey, was drilled to a depth of 2,650 ft. and 7-in. casing was set at 2,649 ft. for the completion.

W. R. Quin and J. R. Hunter et al, of San Antonio, are coring at 8,928 ft. in the D. Zwieg, 9,500-ft. wildcat test 7 miles northeast of Gregory, San Patricio County. The operators are going to take a 3-ft. core and it is reported that a drill-stem test is to be run.

Nueve Oil Co. and H. C. Heldenfels are completing the 1 Guaranty Title & Trust Co. and the well was expected to make approximately 70 bbl. of oil daily on potential. The well flowed 48.5°-gravity oil on test, which is considerably higher than in nearby Corpus Christi deep field production, indicating that a new reservoir has been opened. Completion of the well is being made through perforations at 6,919-22 ft. This new producer is located in Lot 1, Section 12, Russell Farm Lots, Nueces County.

Atlantic Refining Co. has perforated from 5,748-50 ft. in the A-1 W. F. L. Lehman, wildcat test 11½ miles southwest of Corpus Christi, and 1 mile north of Chapman Ranch field, Nueces County. The perforations were squeezed and operators are now waiting on cement to set. No details have been released on the test.

Curtis Singleton Drilling Co. has drilled to a depth of 6,355 ft. in the 1 Sam and George Taylor, wildcat venture 8 miles southwest of Robstown, and have set 5½-in. production pipe at 3,872 ft. for completion attempt. The well is located in Block 7, Section 1, of the Roberts & White Subdivision, Neuces County.

The 44 new locations include 14 wildcat starts, 1 each in Kinney, Travis, Nueces, San Patricio, and Starr counties, 2 each in Duval, Webb, and Bastrop counties, and 3 in McMullen County. There were 2 successful exploratory tests completed, 1 each in Uvalde and Duval counties, while 12 were dry, 1 each in Frio and Kenedy counties, and 2 each in Bastrop, Guadalupe, Duval, Jim Hogg, and Jim Wells counties.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

Duval County: New oil pool "South Rosalia"—Cox & Hamon and John F. Camp & Sons A-2 Driscoll, Block 54, Santa Rosalia Grant, top pay 3,335 ft., TD 3,365 ft., perf. 3,356-59 ft., IP: 96 bbl. oil per day, 3/16-in. choke, GOR 175, TP 125 psi., CP 585 psi., 30.6° gravity.

Uvalde County: Gas-condensate discovery—Phillips Petroleum Co. 1 F. T. Kincaid, Hipolito Sotello Sur. 377, 25 mi. SE of Uvalde, ½ mi. N of Zavala County, TD 1,790 ft., perf. 855-85 ft., IP: 785,000 cu. ft. of gas per day on open flow, no gage on condensate, 56° gravity, SIP 450 psi.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Bastrop County: August Kothmann 1 Albert Rother, J. Black Sur., Sec. 45, dry, TD 3,250 ft.

M. M. Miller 1 Thompsey Wallace, Andrew Mays Sur., A-248, 5 mi. NE of Red Rock, dry, TD 4,008 ft.

Duval County: John F. Camp & Sons et al 1 Servando Benavides Estate, Block 20, O'Hern & Seacord Subd., Share 6, El Mesquite Grant, dry, TD 2,016 ft.

Tiger Minerals, Inc. 1-A W. R. Peters Estate, GB&CNGRR Sur. 39, A-717, dry, TD 2,620 ft.

Frio County: Ginther, Warren & Ginther 1 M. K. Shiner, John D. Morris Sur. 2, A-155, 6 mi. E of Darby, dry, TD 5,610 ft.

Guadalupe County: E. V. Abernathy 1 Mrs. Hulda Voss, W. M. Perkins Sur., 8 mi. SE of San Marcos, dry, TD 890 ft.

W. R. and J. W. Parrish 1 W. M. Gibbons, L. H. Peters Sur., 10 mi. SW of Seguin, dry, TD 2,163 ft.

Jim Hogg County: Humble Oil & Refining Co. 2 Moody Ranch, Sec. 12, Fowler & Rankin Subd. of El Sordo Grant, Moody Ranch area, dry, TD 5,505 ft.

Ritchie, Fallis & Witherspoon 1 E. Gar-

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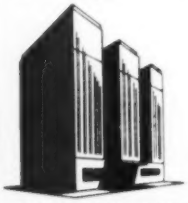

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cia et al, J. S. Williams Sur. 271, 12 mi. SW of Randado, dry, TD 2,228 ft.

Jim Wells County: Callery & Hurt 1 Cumercinda Garcia de Garcia, H. Cruz Sur. 16, A-108, 2 mi. W of Magnolia City field, dry, TD 6,175 ft.

Gaylord H. Chizum 1 Lillian Muil, J. Poitevent Sur. 205, A-371, 5 mi. S. of Alice, dry, TD 4,152 ft.

Kenedy County: Humble Oil & Refining Co. C-2 John G. Kenedy, Jr., East Mifflin area, Las Barrosas Grant, 9 mi. S of Sarita, dry, TD 11,549 ft.

MISSISSIPPI

Lincoln County Discovery Is Completed by Pan-Am

JACKSON.—Pan-Am Production Co. has completed the 1 S. J. Holloway, Jr., SW NW Section 23-6n-6e as the discovery well for the new West Lincoln field, Lincoln County. Through perforations at 10,646-84 ft. in the Lower Tuscaloosa "stringer" sand, the well flowed 154 bbl. of 41.5°-gravity oil on potential, through 10/64-in. choke. Tubing pressure was 700 psi.

Immediate development is under way in the area. Rosser & Pendleton has permits for three locations and has already started drilling on two. One location is ½ mile north of the discovery and the other is 1¼ miles due east.

In Adams County, Humble Oil & Refining Co. has completed the 1 Lucy E. Barksdale, 26-5n-3w, for a new Wilcox discovery. Completion was made through perforations at 6,571-73 ft., and on 20-hour gage the well flowed 143 bbl. of 41.8°-gravity oil through a ⅛-in. choke. Tubing pressure was 620 psi., and casing pressure was 700 psi.

Humble has set 7-in. casing in the 1 Marion Davies, 15-3n-2e, Clarke County, Alabama, wildcat, and is making preparations to perforate and test. The well was drilled to a total depth of 8,093 ft. and casing set at 7,385 ft. Humble has made numerous drill-stem tests in this well, several of which recovered 20°-gravity oil. It is not definitely known how much sand was encountered, but it is rumored that Humble feels assured of a commercial producer.

In Pickens field, Yazoo County, Carter Oil Co. 1 J. L. Wilson, 30-12n-3e, Lower Cretaceous discovery for the area, continues to test on pump. On a 4-day test the well averaged pumping 90 bbl. of oil and 109 bbl. of water per day.

Union Producing Co. 1 Claude Smith, 32-10n-11w, Sherron field, Jones County, Mississippi, is preparing to test after cementing 5½-in. casing at 5,650 ft. This test is 12 ft. higher structurally than the discovery, Red Wing Drilling Co. 1 Torry Smith, and has encountered 21 ft. of very tight gas sand in the second City Bank section, 21 ft. of good gas sand in the upper Stanley section, and 20 ft. of gas sand in the lower Stanley stringers.

Five new wildcats have been staked in Mississippi, one each in Jefferson, Madison, and Yazoo counties and two in Adams County. Alabama has three new locations staked, two of which were wildcats, one each in Choctaw and Marion counties.

MISSISSIPPI SUCCESSFUL WILDCATS

Adams County: New oil pool—Humble Oil & Refining Co. 1 Lucy E. Barksdale, 26-5n-3w, top pay 6,571 ft., Wilcox, TD 6,581 ft., perf. 6,571-73 ft., IP: 143 bbl. oil per day, ⅛-in. choke, TP 620 psi., CP 700 psi., 41.8° gravity.

Lincoln County: New oil pool, "West Lincoln"—Pan-Am Production Co. 1 S. J. Holloway, 23-6n-6e, top pay 10,646 ft., Lower Tuscaloosa sand, TD 10,715 ft., perf. 10,646-84 ft., IP: 154 bbl. oil per day, 10/64-in. choke, TP 700 psi., 41.5° gravity.

MISSISSIPPI WILDCAT FAILURES

Itawamba County: Walter E. Sistrunk 1 O. H. Evans, 16-11s-9e, dry, TD 1,771 ft.

Jefferson County: R. L. Lawrence, Trustee, 1 J. R. Allen, 34-8n-1e, dry, TD 7,026 ft. Humble Oil & Refining Co. B-1 Board of Supervisors, 16-7n-19w, dry, TD 10,105 ft.

Jones County: Ginther-Warren-Ginther 1 Marie J. Black, 12-6n-12w, dry, TD 9,010 ft.

ROCKY MOUNTAIN

Deep Big Horn Test Has Gas Show in Frontier

DENVER.—A show of gas was found in the top of Frontier sand at Hamm Brewing Co.-Trigood Oil Co. wildcat at McCullough Peak, an important deep test in the Big Horn Basin, Park County, Wyoming. The well is 1 Unit, SE NW SW 21-54n-100w, and Frontier was topped at around 11,865 ft. and gas with some condensate bubbled in mud returns from the top of the formation.

A drill-stem test at 11,871-97 ft., with tool open 45 minutes, showed only a slight blow of sweet gas. The operator is now drilling below 11,961 ft. in the Frontier. The zone tested showed hard sand with low porosity and this zone is not productive in other Frontier sand fields in this part of the state. Trigood expects a full Frontier section in the well and will make further tests when porosity of the zone improves. This wildcat is located northeast of Oregon Basin field and southwest of Elk Basin field, in an area where Trigood did extensive seismic work prior to unitizing a large block and making location for the well.

Failure in the Tensleep was a disappointment at the Sinclair Oil & Gas Co. wildcat at 1 Unit, SE SW SW 16-28n-93w, in the Happy Springs area, Fremont County, Wyoming. The well made 6,093 ft. of clear water on 1-hour drill-stem test between 10,003-33 ft. with Tensleep topped at 9,985 ft. There were slight shows in a hard dolomitic zone just above the top of the Tensleep and some staining was logged in the Phosphoria in the well, but tests showed only slight amounts of mud. Sinclair will attempt completion of the wildcat in upper formations. The well was drilled to 10,034 ft., total depth, and has been plugged back to 7,352 ft. where Sinclair will make tests in the Nugget sand. This well showed oil in several upper zones but was planned primarily as a Tensleep test. The well is located 8 miles west of the company's Crooks Gap field, where production is from Muddy and Lakota sands.

British-American Oil Producing Co. is preparing to continue tests in upper sands of the Muddy and Dakota series after drilling to 5,800 ft., total depth, at its 1 Segelke, NE NW NE 26-11n-53w, wildcat in the Armstrong area, Logan County, Colorado. The well found gas, gaging more than 8 million cubic feet daily, from the first sand, between 5,253-85 ft., a second sand at 5,382-93 ft. tested 40°-gravity green oil and water, a third sand between 5,406-15 ft. made 17°-gravity black oil and water. The operator is now running casing prior to testing these zones in an effort to complete a commercial well. The wildcat is 20 miles southwest of fields in the Sidney area, Cheyenne County, Nebraska, and this is the first test in a series of recent wildcat ventures in this area to indicate commercial production. British-American, Plains Exploration Co. of Denver, and others have more than 200,000 acres blocked through this area and another well is planned in the near future.

New locations.—There were 20 new locations during the week, with 15 in Wyoming, 2 each in northern New Mexico and western Nebraska, and 1 in Idaho. The Idaho wildcat is the third in a series being drilled by Helmerich & Payne in the Indian Cove area, Owyhee County. The first two were failures after going from Tertiary beds into basalt at around 2,500 ft. There were several wildcat locations in Wyoming, including one in the North Cole Creek area, Natrona County, by General Petroleum Corp. The well is 7-8-Government, NW SW SW 8-35n-77w, and is planned as an 8,500-ft. Dakota-Lakota test 1 mile northwest of the closest producer in Cole Creek field proper.

Completions.—There were 12 completions, with 9 in Wyoming, 2 in western Nebraska and 1 in Colorado. In Wyoming, Continental Oil Co. announced completion of its discovery in Meadow Creek Unit, the fourth pool in the Sussex-Meadow Creek area. The well was completed for a potential of 300 bbl. of 39°-gravity oil daily with production from the Lakota sand. In western Nebraska, Hollingsworth et al plugged their Cottonwood area wildcat, Dawes County, with total depth in Chugwater at 3,230 ft.

COLORADO WILDCAT FAILURE

Fort Morgan, Morgan County: J. M. Huber Corp. 1 C. S. Lee, C SW NE 2-2n-57w; 5,541 TD; abnd.; Hygiene 2,389, Niobrara 4,694, Timpas 4,993, Muddy 5,445, show oil; Dakota 5,524(?).

WYOMING SUCCESSFUL WILDCAT

Meadow Creek, Johnson County: Continental Oil Co. 1 Unit, NE NE NW 11-41n-78w; 7,555 TD; est. potential 300 bbl. oil per day; 39° gravity; perf. 7,475-90 and 7,504-30; 7-in. casing at 7,554; Mesa Verde 2,643, Steele 3,073, Sussex 3,643, Shannon 4,124, first Wall Creek 6,123, second Wall Creek 6,539, Lakota 7,470.

WYOMING WILDCAT FAILURE

LaBonte Anticline, Converse County: Bob Phillips 1 State-Hale, C SE NW 16-31n-71w; 758 TD; abnd.

NEBRASKA WILDCAT FAILURE

Cottonwood area, Dawes County: Hollings-

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worth-Newell et al 1 Kayten, C SE SE 1-29n-49w; 3,230 TD; abnd.; White River 1,100, Pierre 1,130, Niobrara 1,320, Carlisle 1,603, first Wall Creek 1,672, Greenhorn 1,914, Graneros 1,950, Muddy 2,380, Fuson 2,720, Lakota 2,780, Morrison 2,880, Sundance 2,995, Chugwater 3,210.

LA.-ARK.

Lincoln Parish Wildcat Shows Gas in Drill Stem

SHREVEPORT. — Southwest Natural Producing Co. 1 M. E. Colvin, Lincoln Parish wildcat in 31-20n-2w, ran a drill-stem test on perforations at 8,556-72 ft. in the "D" sand of the Cotton Valley formation, following a 500-gal. acid treatment. With packer at 8,540 ft., and using ¼-in. chokes and 500 ft. of water cushion, maximum tubing pressure was 4 psi, and recovery in 1½ hours was 360 ft. of gas-cut mud. It was reperforated with 24 jet shots from 8,565-71 ft. and acidized with 1,000 gal. At last report it had flowed a small amount of gas by heads.

Sinclair Oil & Gas Co. 1 Vera Oden, 33-19n-13w, was drilling below 6,980 ft., in Travis Peak topped at 5,780 ft., by samples.

Bert Fields 1 Thigpen-Herold, 23-16n-16w, Caddo Parish, was testing the Davis sand of the Cotton Valley through perforations from 8,960-99 ft. After a 2,500-gal. acid treatment the well flowed a small amount of gas and acid water.

John S. Neilon 1 Chas. G. Simmons, SE SE NW 31-15n-4e, new 5,500-ft. wildcat, located on a subsurface prospect 3½ miles south of Bosco, cored sand and shale from 4,664-84 ft., and was coring ahead below 4,812 ft. at last report, said to be in the Wilcox.

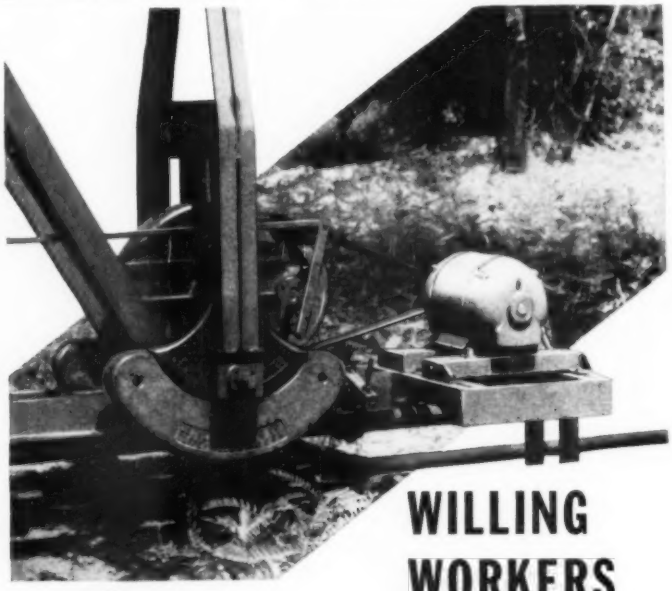
Petersen Drilling Co. 1 Womack & Cotton, Willow Lake deep test in the SE SW 1-6n-6l, was drilling at 7,054 ft. in the Midway. A core from 5,521-47 ft. recovered shale and sand with slight shows of oil and salty taste.

Monla Gas Co. and others 1 Hinton-Allen, 9-19n-1e, Smackover test in Downsville field, Union Parish, was drilling below 12,192 ft., believed to be in the Smackover formation. Seven-inch casing was run to 10,572 ft.

ARKANSAS WILDCAT FAILURES

Ouachita County: McAlester Fuel Co. 1 G. Wright, NE SE SW 25-14s-18w, dry, TD 3,000 ft., no shows.

Union County: Pioneer Drilling Co. 1 Ernest Smith, SW SE SW 15-16s-14w, dry, TD 2,882 ft.



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SOUTH LOUISIANA

Rank Wildcat Has Oil Shows at Two Levels

NEW ORLEANS—Oil shows at two different levels have been confirmed by electric log and side-wall cores at the J. P. Petkas 1 L. K. Nicholson, rank wildcat located 4 miles south of Livonia, 112-9e, Point Coupee Parish. The shows were indicated by log in the Frio section between 8,678 and 9,480 ft. Test is presently coring in the Cockfield at 10,265 ft., and has a projected depth of 10,500 ft. Whether the sands are of commercial worth remains to be seen.

Confirmation of the oil discovery at Roemer's Pass, Plaquemines Parish, was indicated with completion of The California Co. 2 North Main Pass Unit, 22-20s-19e. The well flowed 243 bbl. of 35.3° gravity oil daily through a 9 64-in. choke through perforations at 8,917-49 ft. Tubing pressure was 1,500 psi. The well has a 40-ft. oil sand and 131-ft. net gas sand. The confirmation test ran 19 ft. higher than the discovery well for the field.

Tumultuous weather has hampered efforts to further test the Magnolia Petroleum Co. A-2 State Lease 693, new oil discovery located 25 miles off St. Mary Parish. Two additional sections have been perforated in the well, from 11,648-56 ft., adding 8 ft. to the initial 2-ft. section of perforations at 11,656-58 ft. It will be recalled that this well flowed an estimated 372 bbl. of oil daily on initial test.

Meanwhile, Magnolia is preparing to test the A-1 State Lease 685, Block 95, off Iberia Parish. The test, which is bottomed at 12,095 ft., is reported to have several new gas sands not found in a previous gas well completed from this structure.

Joe W. Brown has opened new pay in Valentine field, Lafourche Parish, at the 1 South Coast Corp., which was drilled to 11,340 ft. on the north flank of the dome. Five sands between 10,860-11,175 ft. were found capable of producing gas and distillate, net thickness of which totaled 170 ft. The well was completed at 11,145-65 ft.

The 29 new locations include 1 wildcat start in Washington Parish. There was one successful exploratory well completed in St. Mary Parish while one was reported dry in Iberville Parish.

SOUTH LOUISIANA SUCCESSFUL WILDCAT

St. Mary Parish: New pay at South Jeanerett—Atlantic Refining Co. 7 Joseph A. Blanchard, 37-13s-9e, top pay 5,922 ft., TD 6,650 ft., perf. 5,940-46 ft., IP: 162 bbl. oil per day, ⅛-in. choke, TP 835 psi., CP 950 psi., 32.3° gravity.

SOUTH LOUISIANA WILDCAT FAILURE

Iberville Parish: Humble Oil & Refining Co. D-1 E. H. Schwing et al, 13-10s-10e, on Bayou Sorrels prospect, dry, TD 11,738 ft.

OKLAHOMA

Elk City Field Extended Another Mile Westward

ANOTHER major extension for the already widespread Elk City field of Beckham and Washita counties, western Oklahoma, is virtually assured by showings in a drill-stem test at Shell Oil Co. 1-F State, 12-10n-22w. This well is more than a mile southwest of the field's nearest producer, Shell's 1 Ada Smith, which, in turn, is a mile west of production at the northwestern tip of field.

The drill-stem test, the first for the well, was made in the field's conglomerate pay zone at 9,970-98 ft. In it, gas showed 43 minutes after the tester was open and fluid was at the surface 14 minutes later. During the remaining 18 minutes of the test, the well flowed 18 bbl. of oil, or at the rate of 60 bbl. per hour, with a gas-oil ratio of 1,350 cu. ft. per barrel. Recovery following the test was 2,790 ft. of oil and 120 ft. of oil and gas-cut mud. Gravity of the oil was 47.2°. Hole is being deepened through the field's known pay zones.

Carter Oil Co. 1 Lee Galloway, NE NE NW 22-8n-18w, southern Washita County, is being completed as the discovery well of the West Rocky field. With 2½-in. tubing run to 5,349 ft. and Granite Wash pay zone open at 5,327-55 ft., the well swabbed 53 bbl. of load oil in 3 hours, and then started flowing, making 131 bbl. in the next 13½ hours with gas at the rate of 4,550,000 cu. ft. per day. During the next 18 hours, it flowed 41 bbl. of new oil, 2 per cent mud, with gas at the rate of 330,000 cu. ft. per day. Tubing pressure was 65 psi. and casing pressure 150 psi.

A second pay zone, the Hart sand, has been found by W. E. Anderson and Phillips Petroleum Co. at their 1 Rill, C NE NW 34-4n-3w, a mile west of production of the Southwest Maysville pool, Garvin County. The sand was topped at 7,108 ft., and in a drill-stem test at 7,116-63 ft., the well flowed gas estimated at 10,000,000 cu. ft. per day and distillate at the rate of 12 bbl. per hour. Bottom of the hole is 7,331 ft. Casing has been run to 7,315 ft. Good saturation previously had been found in the Gibson sand, topped at 7,012 ft. In a drill-stem test of the latter pay at 7,013-65 ft., the well flowed at the rate of more than 35 bbl. of oil per hour.

Another Bartlesville sand discovery appears to have been made in Payne County by Kingwood Oil Co. at is 1 Murphy, SW SW SE 27-18n-1e. The Bartlesville interval was logged at 4,783-4,827 ft. with bottom of the hole at 4,829 ft. A drill-stem test of an interval at 4,782-4,806 ft. resulted in a recovery of 90 ft. of oil and 130 ft. of heavily oil-cut mud. A bottom-hole flowing pressure of 120 psi. was recorded, and with the well shut in pressure built up to 1,640 psi. in 20 minutes.

Wood Oil Co. and Flynn Oil Co.'s new discovery well, 1 Eaton, SW NE SE 35-19n-4e, 6½ miles northeast of Cushing, in eastern Payne County, flowed 4 bbl. of new oil per hour through tubing following a hydrafrac treatment of its pay zone, the Red Fork sand at 3,513-35 ft.

Stanolind Oil & Gas Co. 1 Thacker, SW NW NW 25-1s-4w, ¾ mile southwest of production in the Sholem Alechem pool, Stephens County, had a 4,200-ft. fillup of 23° oil in 20 hours after perforating casing at 5,668-86 ft. in the Springer sand, topped at 5,635 ft. On a late swabbing test it made 99 bbl. of oil in 12 hours, showing a small amount of water.

Phillips Petroleum Co. 1 Minnette, SW NW NW 3-1s-3w, deep test east of the Tatums pool, Carter County, got 40 ft. of gas-cut mud, 90 ft. of oil-cut mud and 90 ft. of mud-cut oil in a drill-stem test of a sand at 4,967-5,010 ft. Operators are drilling ahead to lower objectives.

Sinclair Oil & Gas Co. 2 Sullins, NE NW NE 12-23n-1w, a mile north of the north tip of the one-well-wide South Ceres pool, Noble County, flowed 355 bbl. of oil, of which 278 bbl. was new 40.6° oil, in 7¾ hours following a hydrafrac treatment of its pay zone, the Red Fork sand, at 4,414-58 ft. Flow was through 1-in. choke for 4¾ hours and 31/64-in. choke for 3 hours. Gas production was estimated at 800,000 cu. ft. per day. At the north tip of the pool, British American Oil Producing Co. extended the pool's Bartlesville sand pay zone another 10 acres northward at its 3 Schultz, SE NE NW 13-23n-7w. The well flowed 311 bbl. of oil in 21 hours through various chokes. Of this production, 120 bbl. was in 8 hours through 12/64-in. choke.

OKLAHOMA WILDCAT FAILURES

Caddo County, Apache area: Cities Service 1 Chalepah, NW NW NW 10-5n-12w, dry, TD 7,200 ft., Caney 3,115 ft., Sycamore 3,470 ft., Woodford 4,280 ft., Hunton 4,980 ft., Chimney Hill 5,645 ft., Sylvan dolomite 5,870 ft., Viola 6,000 ft., dense 6,900 ft., green shale 6,990 ft., first Wilcox 7,065 ft., sand 7,110 ft., second Wilcox 7,140 ft.

Coal County: W. H. Martgen 1 Jennings, SW SW NW 19-2n-11e, dry, TD 2,915 ft., no tops reported.

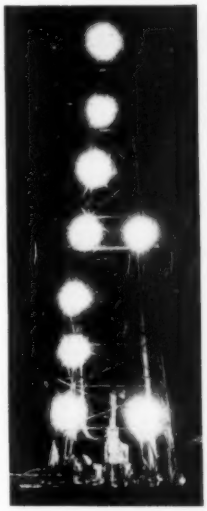
Comanche County: Smith-Marshall & Aldridge 1 Carothers, SW SW NE 27-2n-11w, dry, TD 200 ft., no log.

Cotton County: Wilcox 1 Jordan, SW SW SE 14-5s-13w, dry, TD 596 ft., no electric log.

Creek County, Cushing area: Big Four 1 Moore, NW NW NW 27-19n-7e, dry, TD 3,235 ft., no tops reported.

Hughes County: Barnsdall 1 Hughes, NE NE NE 28-8n-10e, dry, TD 3,415 ft., shale 3,329 ft., sandy shale 3,335 ft., sandy lime 3,367 ft., shale 3,404 ft., sand 3,410 ft., geological wildcat.

Fuhrman area: Lake Oil Co. 1 Powell, NE NW SW 35-9n-9e, dry, TD 3,420 ft., Bartlesville 2,090 ft., lime 2,398 ft., Booch 2,598 ft., Gilcrease 2,720 ft., middle Gilcrease 2,945 ft., lower Gilcrease



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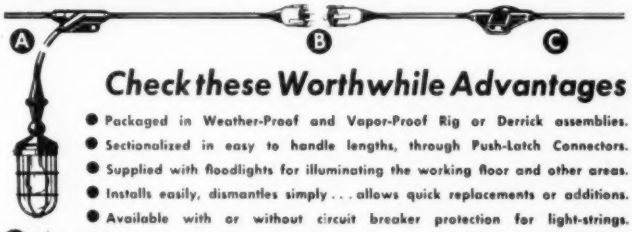

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Kiowa County: Paco Oil Co. 1 Dale, SW NW SW 11-7n-17w, dry, TD 1,902 ft. in shale, limy sand 1,513 ft., lime 1,818 ft. and 1,858 ft.

Lincoln County, N. Agra area: Foster Drilling I Croker, SW SW SE 27-17n-5e, dry, TD 3,476 ft., no tops reported.

Okmulgee County, SE Oklahoma Central area: Sloan Oil & Gas 1 Thompson Ranch, SE SE SW 18-15n-11e, dry, TD 3,123 ft., lime 2,617 ft., shale and shells 2,637 ft., shale 2,664 ft., Mississippian 2,751 ft., Woodford 3,008 ft., Sylvan 3,034 ft., Viola 3,070 ft., sandy dolomite 3,105 ft., Wilcox 3,112 ft.

Pawnee County: Woods 1 Berry, SW SE NW 20-22n-6e, dry, TD 3,270 ft., Dewey 1,670 ft., upper Layton 1,815 ft., Hogshooter 1,978 ft., lower Layton 2,010 ft., Checkerboard 2,303 ft., Big lime 2,475 ft., basal Oswego 2,632 ft., upper Skinner 2,673 ft., lower Skinner 2,788 ft., lime 2,808 ft., Mississippian 2,996 ft., Woodford 3,190 ft., dolomite 3,202 ft., Wilcox 3,223 ft.

Payne County, N. Garr area: Westgate-Greenland Oil 1 State, NW NW SE 36-20n-4e, dry, TD 4,070 ft., Dewey 2,192 ft., Peoples sand 2,361 ft., upper Hogshooter 2,578 ft., Layton 2,653 ft., lower Hogshooter 2,791 ft., Lenopah 2,896 ft., Oswego 3,110 ft., Verdigris 3,406 ft., lime 3,535 ft. and 3,725 ft., Mississippian 3,838 ft., Woodford 3,932 ft., Misener 3,963 ft.

SW Yale area: Kingery Brothers Drilling 1 Laughlin, NW NE NW 25-19n-5e, dry, dry, TD 2,982 ft., Checkerboard 2,415 ft., Peru 2,723 ft., Prue 2,898 ft.

Pontotoc County: Barnsdall 1 Busby, SW SE NW 12-4n-8e, dry, TD 5,810 ft., Atoka 2,715 ft., Gilcrease sand 2,725 ft., unconformity 3,515 ft., Wapanucka 3,535 ft., Union Valley 3,726 ft., first Cromwell 3,784 ft., second Cromwell 4,031 ft., Caney 4,092 ft., Mayes 4,517 ft., Woodford 4,750 ft., Harrington-Hunton 4,918 ft., Chimney Hill 4,932 ft., Sylvan 5,044 ft., Fernvale-Viola 5,140 ft., Trenton-Viola 5,198 ft., bromide dense 5,270 ft., first bromide sand 5,332 ft., second bromide sand 5,416 ft., top McLish 5,512 ft., base McLish 5,728 ft.

CANADIAN FIELDS

Athabaska Wildcat Rated As Natural-Gas Discovery

CALGARY—Alberta recorded its seventh natural-gas discovery of the year when Bear Oil Co., Ltd., received a substantial flow of gas from the Upper Devonian at its Brandi wildcat near Athabaska, in the north-central sector of the province.

The new gas-discovery well, 1 Bear-Brandi, LSD 9, 23-66-22w4, about 82 miles northeast of Edmonton, ran a 34-minute drill-stem test in the D1 Devonian zone interval 1,708-38 ft. and received a natural-gas flow rate of 2,060,000 cu. ft. daily. Hole was carried down to 2,684 ft., in the D3 zone, but it was found water-bearing. Crew is now preparing to plug back, run casing in D1, perforate, and test, prior to completing a gas well.

Two independent American oil operators from Evansville, Ind., have commenced drilling at their initial joint wildcat in Alberta province, about 80 miles northeast of Edmonton. The well, backed by independents George C. Schoonmaker and J. W. McCummings, is located on the Saddle Lake Indian Reserve, about 14 miles west-southwest of St. Paul gas production.

The new venture, 1 Schoonmaker-Saddle Lake, in LSD 9, 12-57-11w4, is 5 miles south-southeast of Saddle Lake and 12 miles southwest of St. Paul town. Scheduled as a Devonian test, the new Saddle Lake wildcat will go down to a probable completion depth of around 3,500 ft. Drilling is now proceeding below 1,370 ft.

Another "Pacific Group" driller in northwest Redwater indicated encouragement when it topped D3 zone of Devonian. The well, C.A.P.P. 1-19F Redwater, LSD 1, 19-58-22w4, about $\frac{3}{8}$ mile northwest of production, is now diamond coring in search of D3 porosity below 3,234 ft. C.A.P.P. 1-19F topped D3 at 3,234 ft. (1,184 ft. subsea), about 54 ft. above the water line.

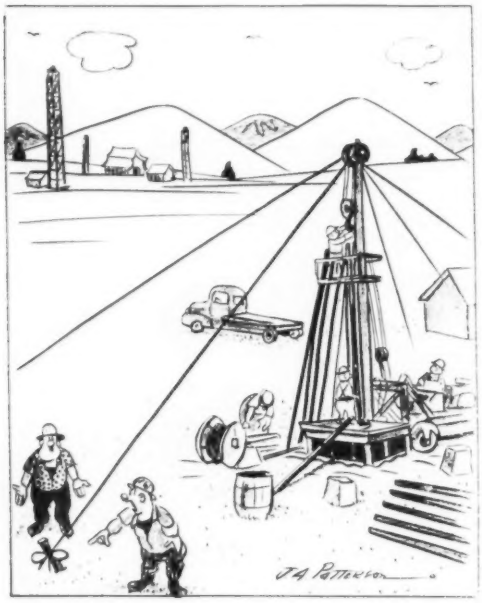
Woodbend Devon Oils, Ltd., Edmonton independent, was successful at its D2 Devonian well on an Imperial Oil, Ltd., farm-out near the southern fringe of Leduc field.

The new producer, 1 Algie-Leduc, LSD 6, 33-49-26w4, on the same location as 159 Imperial D3 oil well, flowed at the rate of 12 bbl. hourly during a test of unspecified length, indicating a daily potential of 288 bbl. Hole was completed at 5,224 ft., $5\frac{1}{2}$-in. casing set at 5,190 ft., a 1,500-gal. acid treatment applied, and the well was placed on potential test. The well is now reported to be on steady production at the market allowable rate.

Under farm-out agreement with Imperial, Woodbend Devon has the D2 rights only on four legal subdivisions in the southwest quarter of Section 33-49-26w4. Imperial's consideration for the farm-out is an oil payment of 5,000 bbl. per well, out of 10 per cent of production.

Twenty-two wells were completed in Alberta Province during the past week, boosting total completions for the first $3\frac{1}{2}$ months of this year to 197. This week's list included 17 oil wells and 5 failures. Redwater had 13 of the successful completions, Leduc-Woodbend 3, and 1 at Campbell.

Imperial Oil, Ltd., placed another seven oil wells on steady production at Redwater this week, and abandoned another hole at around 45 ft., after running into mechanical difficulties. The team of Royalite Oil Co., Ltd., and Triad Lease, Ltd., accounted



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for four Redwater producers; Pacific Petroleums & Associates, two successful completions; while Bishop Oil Co. placed its second Redwater field completion on production.

At Leduc-Woodbend, the Home-Anglo-C. & E. team completed another Woodbend D2 oil well; Woodbend Devon Oils, Ltd., placed its initial D2 oil well on production; and Imperial Oil, Ltd., added another Leduc producer to its list.

The Redwater Leaseholds-Northern Development team placed its 2 Campbell on production, and is installing pump at No. 3 well, the third assured producer for the Lower Cretaceous oil pool.

The four failures this week, in other areas, include: Shaw & McLatchie's 1 Lloydminster; the A. G. Bailey Group's Vilna wildcat, an effort to extend the Spedden gas discovery; the Time-Texaco 1 Holburn exploratory test; and Sun Oil Co. 1 Throne wildcat, in southeast Alberta.

UNSUCCESSFUL WILDCATS

Time-Texaco 1 Holburn, LSD 4, 11-51-1w5, TD 6,621 ft.

Sun 1 Throne-Province, LSD 16, 22-36-9w4, TD 5,865 ft.

Bailey 1 Vilna, LSD 8, 33-59-13w4, TD 2,000 ft.

N. CENTRAL TEXAS

Wise County Discovery Is Completed as Oil Producer

WICHITA FALLS—Cities Service Oil Co. 1 Williamson, northwest Wise County discovery which has been testing for several weeks, completed as an Ellenburger discovery for a daily potential of 265 bbl. of 39.5°-gravity oil, by swabbing, from casing perforations at 7,272-88 ft. The section had been treated with 1,500 gal. of acid. Location is 5 miles northwest of Alvord in Block 4, Falls CSL Survey, A-988.

Scott Daly 1 Jack Daly, Block 49, MEP&P Survey, southeast outpost to the Daly Ellenburger and Caddo field of southwestern Wise County, but separated from producers in the field by a dry hole, was drilling below 3,020 ft.

Signal Oil & Gas Co. 1 J. I. Gentry, wildcat in Block 82, Lower Matagorda CSL Survey, A-435, just north of Cottondale, drilled plug on 7-in. casing at 3,570 ft. and was bailing mud before testing. It was showing some oil and gas. Signal Oil & Gas Co. and Lone Star Producing Co. 1 C. J. Lamance, wildcat 7 miles northeast of the Daly field, Section 29, T&P Survey, A-842, had total depth at 5,467 ft. Operators were running 7-in. casing before fishing tools stuck at 4,467 ft.

A new Strawn sand discovery was completed by Bridwell Oil Co. at its 1-C Bridwell-Jackson, W. B. Aldridge Survey, A-2, 10 miles northeast of Archer City and about 2 miles northwest of North Chalk Hill field. Total depth was 5,120 ft., plugged back to 4,010 ft. Sand from 3,977-4,010 ft. was shot with 140 qt. of nitro, after which it pumped 126½ bbl. of 42°-gravity oil a day, with gas-oil ratio of 200 cu. ft.

New exploration work located and in the planning stage, included: J. J. Lynn, of Mineral Wells, 1-A Dora Shawver, to be located 6 miles northwest of Perrin in Jack County, and about 2 miles southwest of Worsham-Steed field, 330 ft. from north and east lines of lease in the F. E. Foster Survey, A-2,193. Proposed depth was 5,200 ft.

Nine miles northwest of Jacksboro and 3½ miles northeast of McDonald field, was location for a 6,500-ft. rotary wildcat by Henry Grace Production Co. It is the 2 D. Lindsey, 330 ft. from south and west lines of lease in the J. Zimmer Survey, A-1,733.

In Throckmorton County, Lester & Duffield, Inc., et al staked location for 1 A. Noles, wildcat 4½ miles southwest of Throckmorton and about 4 miles west of present production. Drill site was 467 ft. from north and 1,000 ft. from east lines of the northwest quarter, Section 251, BBB&C Survey. Proposed depth was around 5,000 ft.

C. T. Robertson filed application to drill a semiwildcat 8 miles northwest of Graham and some 1,650 ft. southwest of production, as the 1 E. B. Burch, Section 466, TE&L Survey, Young County. It will test to 5,000 ft.

In Archer County, 2 miles south of Windthorst, J. C. Man 1 Ernest Schrieber, 330 ft. from north and west lines, Lot 68, Block 4, Clark & Plumb Subdivision, was drilling ahead at 2,720 ft., on a 5,100-ft. contract. The wildcat is 5 miles northeast of Burns-Jones field.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Jones County: Street Investment Co. 2-A R. E. Windham, 17-19-T&P, SW corner of county, TD 4,477 ft., PB 4,092 ft., elev. 1,909 ft., perf. 4,080-90 ft., pumped 40 bbl. of 40°-gravity oil a day, GOR 800 cu. ft.

Stephens County: Texo Oil Co. 1 McMeen, 47-5-T&P, 1½ mi. SW Caddo, TD 2,201 ft., pay 2,152 ft., pumped 45½ bbl. of 45°-gravity oil a day.

Throckmorton County, 1½ mi. E extension to Bessie field: Shamrock Oil & Gas Corp. 1 Bessie Rhodes, N½ NW NE Sec. 275, BBB&C Sur., 1 mi. N and ½ mi. W Throckmorton, TD 3,274 ft., top Caddo pay 3,253 ft., flowed 115.9 bbl. of 39°-gravity oil a day, GOR 430 cu. ft., CP 200 psi., TP 50 psi.

Wichita County: Consolidated Oil Co. 1 G. W. Hund, Robert Evans Sur., A-74, 3 mi. W Wichita Falls, TD 4,310 ft., elev. 1,020 ft., sand pay 4,244 ft., flowed 110 bbl. of 42°-gravity oil in 14 hr.

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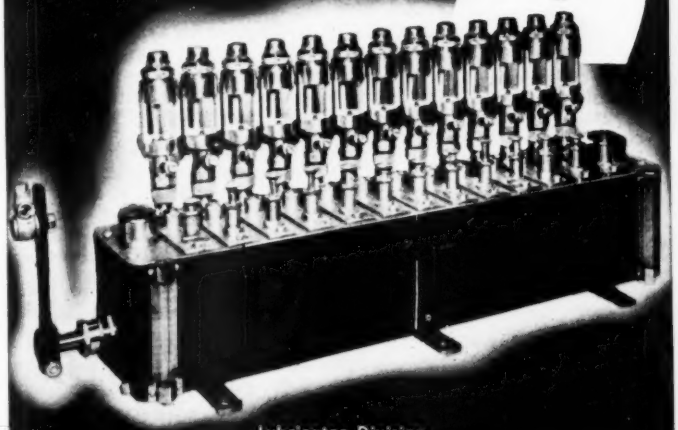

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NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: L. E. Trout 1 Mrs. H. E. Wright, Sec. 2435, TE&L Sur., 1½ mi. E Megargel, dry, TD 1,450 ft., sand with oil show 1,418 ft.

Baylor County: J. L. Crawford 1 Viola Hunt, Colorado CSL Sur., A-134, 13 mi. S Seymour, dry, TD 5,632 ft., elev. 1,407 ft.

Garvin-Livingston-Hall 1 Claud Farr "A," N. Dennis Sur., A-141, 6 mi. W Westover, dry, TD 690 ft.

Garvin-Livingston-Hall 1 Claud Farr "B," N. Dennis Sur., A-141, 6 mi. W Westover, dry, TD 654 ft.

Clay County: Roy L. River 1 R. F. Wynn, Cornelius Rooney Sur., A-392, 7 mi. W Bellevue, dry, TD 4,023 ft.

Comanche County: Burdell Oil Co. 1 Jess Cuthbertson, Sec. 32, ETRR Sur., 6½ mi. NW Comanche, dry, TD 2,861 ft., elev. 1,426 ft., sand 1,350 ft., Duffer 2,665 ft., lower Marble Falls 2,510 ft., Mississippian 2,835 ft.

Kilmarnock Oil Co. 1 W. C. Ferrill, Jr., Benjamin Mimms Sur., A-637, 2 mi. S Sidney, dry, TD 2,847 ft., elev. 1,513 ft., Marble Falls 2,309 ft., Ellenburger 2,572 ft.

Hood County: J. K. Wadley 1 Guy Randle, Jas. M. Taylor Sur., 1½ mi. NE Octon, dry, TD 4,011 ft., elev. 850 ft.

Jones County: Rhodes & Sullivan Drilling Co. 1 D. C. Richardson, Ambrose Crain Sur. 214, 12 mi. SW Anson, dry, TD 3,425 ft., elev. 1,855 ft., Flippen 2,885 ft., Swastika 3,368 ft.

Roark, Hooker & Roark et al 2 Dr. A. R. Thamasson, Sec. 54, S. R. Heard Sur., 15 mi. N Merkel, dry, TD 4,759 ft., lime 4,447 ft.

Robinson-Puckett, Inc. 1 J. T. Casady, Sec. 49, D&DA Sur., 5 mi. NE Anson, dry, TD 5,408 ft., elev. 1,625 ft., King sand 2,500 ft., Gunsight 2,580 ft., Swastika 2,670 ft., Palo Pinto 5,050 ft., Ellenburger 5,280 ft.

Knox County: Frank Wood 1 Joe Maloney, R. Wilkins Sur. 216, A-411, 2 mi. SW Goree, dry, TD 2,005 ft., elev. 1,426 ft.

Montague County: A. R. McElreath 1 A. Durham, E. B. Wooten Sur., A-840, 5 mi. NE Bonita, dry, TD 4,244 ft., elev. 978 ft., granite was with oil show 4,024-27 ft.

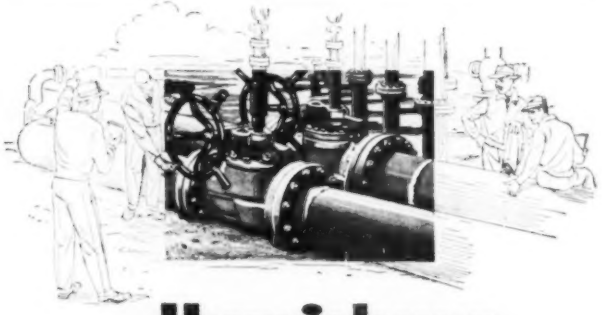
Shackelford County: R. E. Key and C. T. Walter 1 W. H. Green, 49-12-T&P, 12 mi. SW Albany, dry, TD 1,213 ft.

Taylor County: Chester Imes 1 Chas. Foster, Jr., Sec. 44, BAL Sur., 4 mi. E Abilene, dry, TD 2,445 ft.

Robinson & Puckett 1 H. A. Sheppard, 122-64-H&TC, 5 mi. SE Shep, dry, TD 5,580 ft., elev. 2,174 ft., Noodle Creek 2,660 ft., Saddle Creek 2,915 ft., Flippen 2,978 ft., reef 3,830 ft., Palo Pinto 4,335 ft., upper Caps 4,620 ft., lower Caps 4,825 ft., Caddo 5,311 ft., Ellenburger 5,470 ft., Ellenburger had gas and oil-cut mud on DST.

Wichita County: Palmer Drilling Co. 1 H. A. Mills, Blk. 5, Red River Valley Land Subd., 3 mi. SE Burkburnett, dry, TD 2,049 ft.

Wilbarger County: P. C. Burns 1 R. L. Castlebury, 66-14-H&TC, 7 mi. S Vernon, dry, TD 2,258 ft.



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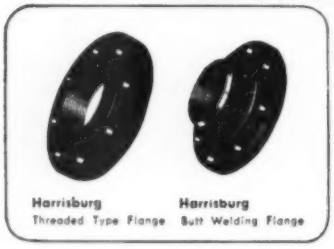

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APPALACHIAN FIELD

Drilling Activity High In West Virginia

PITTSBURGH.—Baileysville district, Wyoming County, West Virginia, accounted for a good shallow sand gas well: United Producing Co. 95-1676 W. M. Ritter Lumber Co., elevation 1,482 ft., gaged 4,855,000 cu. ft. after shot in the Berea sand, total depth 3,725 ft. Thirteen Oriskany sand tests are under way in the Limestone Hill section (Tri-County area): Grant district, Jackson County, Davis-Kelly Gas Co. 1 E. E. Conger et al, elevation 864 ft., drilling at 2,627 ft. Tucker district, Wirt County, Clarence W. Meadows, Agent 1-L-471 F. W. Betts, elevation 900 ft., drilling at 1,900 ft.; United Fuel Gas Co. 652 R. J. Moore, elevation 994 ft., drilling at 4,930 ft.; Glen W. Roberts 1 H. W. Stephens, elevation 1,070 ft., running 5½-in. casing at 5,296 ft., with Corniferous lime topped at 5,272 ft.; Roberts 1 Forrest Daugherty, elevation 1,066 ft., drilling at 3,003 ft.; Steele district, Wood County, Godfrey L. Cabot, Inc. 1320 J. H. Brown, elevation 879 ft., drilling at 1,050 ft.; Columbian Carbon Co. 1144 Harry Beard et al, elevation 1,028 ft., drilling at 5,033 ft.; 1143 Godfrey L. Cabot (Ruble tract), elevation 908 ft., drilling at 2,184 ft.; 1145 Godfrey L. Cabot (Dye tract), elevation 823 ft., fishing at 2,072 ft.; Hope Natural Gas Co. 9409 A. J. Holbert, elevation 760 ft., drilling at 4,510 ft.; Clarence W. Meadows, Agent 2-L-449 C. A. Barnett, elevation 1,080 ft., drilling at 4,075 ft.; United Carbon Co. et al 1682 M. E. Stuckey, elevation 960 ft., drilling at 2,150 ft.; United Fuel Gas Co. 6465 O. H. Blair, elevation 1,078 ft., drilling at 1,050 ft.

In Wharton Township, Fayette County, Pennsylvania, preparations are being made by William E. Snee et al to acidize 3 Indian Creek Coal & Coke Co., elevation 2,615 ft. This well was first shot in the chert gas pay. In Georges Township, Orville Eberly et al 1 N. E. Murphy, elevation 2,560 ft., after overcoming a fishing job, resumed drilling and is at a depth of 7,515 ft. In Napier Township, Bedford County, South Penn et al-Snee & Eberly 1 Jesse B. Miller, elevation 1,666 ft., commenced fishing operations on the tools which were stuck in the hole at 7,255 ft.

There were 25 new locations in West Virginia, and 5 in southwest Pennsylvania, during the past week.

PERMIAN BASIN

New Reef Discovery in Kent County Is Testing

MIDLAND—Caroline Hunt Trust Estate 1 J. W. Young, 166-G-W&NW Survey, new reef discovery 7½ miles northwest of Clairemont in Kent County, plugged back to 6,680 ft. from 7,232 ft., and completed for a daily potential of 2,184 bbl. of oil. Production was through ¾-in. choke from pay at 6,484-6,520 ft., and potential was based on a flow of 819 bbl. of oil in 9 hours, with no water. Oil tested 39° gravity and gas-oil ratio was 338 cu. ft. Flowing pressures were 325 psi. on casing and 225 psi. on tubing.

The same operators' 2 J. W. Young, 3,000 ft. south of the discovery, in 145-G-W&NW, was drilling on surface hole. A west offset to the discovery, Nelson Bunker Hunt 1 Texas Christian University, in Section 3, was drilling below surface casing.

In Cogdell field a new pay was in prospect at J. A. Chapman Producing Co. 6 D. M. Cogdell, located 2,052 ft. from north and 2,703 ft. from east lines, 716-97-H&TC, and ½ mile east of Chapman's 3 Cogdell, most northerly completed producer.

A drill-stem test from 4,898-4,970 ft., open 1½ hours, showed gas in 10 minutes, mud in 25 minutes and oil in 30 minutes, then flowed 68 bbl. of 41°-gravity oil in the last 60 minutes of the test. Recovery was reversed out and no estimate made. According to early reports, the section was thought to be Wolfcamp, or lower Permian, but some geologists expressed the opinion that the lime, topped at 4,834 ft., may be Cisco, of the upper Pennsylvanian. At last report, operators were waiting on cement after setting 7-in. casing at 4,970 ft., total depth. Best pay in the section was placed at 4,910-26 ft.

A 1-mile west extension to Cogdell field was completed at D. D. Feldman 1 P. L. Fuller, approximately NE NE 703-97-H&TC. Flowing through ¾-in. choke, from open hole at 6,881-6,915 ft., total depth, the well rated a daily potential of 602 bbl. of 42°-gravity oil, based on a 12-hour flow. Gas-oil ratio was 620 cu. ft., and flowing pressures were 200 psi. on casing and 100 psi. on tubing. On elevation of 2,451 ft., top of the reef was 6,881 ft.

Water table in Cogdell field has been established by Humble Oil & Refining Co. 1 LeRoy Spires, west offset to the field discovery, which recovered 150 ft. of oil and gas-cut mud, plus 350 ft. of salt water, on a 90-minute drill-stem test from 7,000-15 ft. According to reports, the well had a pay section of about 100 ft. and operators were to plug back for completion.

Mid-Continent Petroleum Corp. 1 Bilby-Wallace, Tract 3, 776-97-H&TC, 5 miles northeast of Cogdell field, was testing in the Ellenburger from 7,336-61 ft. Tentative top on the formation was 7,336 ft., or minus 5,304 ft.

Ten miles east of the field, Goff & Sutton 1 Fleming Foundation, NE NE 53-K-T, A. Thompson Survey, was drilling shale below 5,685 ft.

In the Reinecke area, southeast Borden County, George P. Livermore, Inc. 1 D. F. Whitaker, NW SW 53-25-H&TC, south offset to the field discovery, completed for a daily flowing potential of 3,976 bbl. of oil a day, a record for the field. The rating was based on a 6-hour test through open 2-in. tubing, from open hole at 6,723-92 ft., total depth. Flowing pressures were 365 psi. on tubing and 1,250 psi. on casing. Livermore has suggested North Vincent as the new field name.

Castleman & O'Neill 1-A Griffin, 1-mile west extension to Reinecke field, in approximately NE NE 51-25-H&TC, completed for a potential of 2,010 bbl. of 46°-gravity oil, based on a 6-hour test. Gas-oil ratio was 1,150 cu. ft., and flowing pressures were 900 psi. on casing and 200 psi. on tubing. The well had flowed an estimated 60 bbl.

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an hour for 45 minutes on a drill-stem test from 6,845-6,889 ft. On elevation of 2,366 ft., top of reef was 6,864 ft. Seven-inch casing was set to 6,866 ft.

In west-central Mitchell County, Gulf Oil Corp. 1-E-A O. D. Dillingham, SE SW 9-28-1S-T&P, ½ mile northeast of Superior Oil Co. 1 Dockery, Ellenburger discovery and southwest of Superior's 2 Jim Plaster, extension well, completed dry at 8,045 ft. in dolomite. On elevation of 2,183 ft., the well logged top of the Ellenburger at 7,980 ft. The well had flowed some oil from the Ellenburger, and was swabbed through several sets of perforations but operators were unable to make a commercial well.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCATS

Borden County: Barnsdall Oil Co. 1 W. L. Wilson, NE NE 16-27-H&TC, SE corner of county, TD 7,452 ft., elev. 2,469 ft., top Pennsylvanian pay 7,414 ft., 7-in. casing 7,428 ft., flowed 1,604 bbl. of 47°-gravity oil a day, ½-in. choke, GOR 898 cu. ft., TP 950 psi., CP 850 psi.

Runnels County: E. K. & E. M. Burt et al 2 Mrs. Malinda Jameson, ETRR Sur. 118, 1½ mi. NW Talpa in Ogden-Mabee area, TD 3,390 ft., elev. 1,949 ft., top Fry sand 3,387 ft., flowed 121.8 bbl. of 45°-gravity oil in 7 hr., 24/64-in. choke, GOR 600 cu. ft., TP 125 psi., CP 550 psi.

Scurry County, 1¼-mi. SW extension to Sharon Ridge Canyon field: Warren Oil Corp. 1 J. M. Reynolds, SE NE 101-25-H&TC, TD 6,708 ft., elev. 2,282 ft., top reef pay 6,553 ft., 7-in. casing 6,683 ft., perf. 6,628-48 ft., 6,649-85 ft., and 20 shots in open hole at 6,700-05 ft., flowed 2,694 bbl. of 47°-gravity oil a day, 1-in. choke, GOR 1,050 cu. ft., TP 525 psi., CP 575 psi.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Andrews County: Stanolind Oil & Gas Co. 1 W. T. Stiles, NW NW 8-A38-PSL, 6 mi. W Fullerton Deep field, dry, TD 11,500 ft., elev. 3,414 ft. Wichita Albany 7,360 ft., Woodford 8,365 ft., Devonian 8,598 ft., Fusselman 10,080 ft., Simpson 10,600 ft., Ellenburger 11,270 ft., pre-Cambrian 11,270 ft.

Ector County: Edward C. Lawson 1 Paul Moss, SW SW 32-44-2S-T&P, between Harper and Penwell fields, TD 6,050 ft., elev. 3,023 ft., Yates 2,530 ft., Grayburg 3,530 ft., San Andres 3,975 ft., Glorietta 5,015 ft.

Kent County: William Herbert Hunt Trust 1 Girard Trust Co., SE SE 98-1-H&GN, NW part of county, dry, TD 7,675 ft., elev. 2,121 ft., reef 6,855 ft., Ellenburger 7,662 ft.

Ted Weiner and Sohio Petroleum Co. 1 Alice A. Corriker, SW NW 87-G-W&-NW, 9 mi. W Clairmont, dry, TD 7,683 ft., elev. 2,252 ft., San Angelo 2,200 ft., Pennsylvanian reef 6,727 ft., Strawn 6,995 ft., Mississippian 7,445 ft., Ellenburger 7,676 ft.

Pecos County: Hunt Oil Co. 19 Elsinore Royalti Co., 56-D-GC&SF, 12 mi. S Ft. Stockton, dry, TD 22,90 ft.

S. J. Miles 1 Blackstone-Slaughter, 10-T-TCRR, 15 mi. W Sheffield, dry, TD 2,894 ft.

Tom Green County: W. R. Blackwell and S. H. Murray 1 L. T. Clark, Sec. 254, G. A. Rain Sur., 7 mi. NW Water Valley, 1¼ mi. NE Water Valley field, dry, TD 1,213 ft.

TEXAS PANHANDLE (DISTRICT 10) WILDCAT FAILURE

Oldham County: Hooper & Duke Oil Co. 1 W. T. Howard, NW SE GB&C Sur., 3 mi. E, 6 mi. S Adrien, dry, TD 5,131 ft., elev. 4,143 ft., show of gas 2,590 ft. and 2,650 ft.

SOUTHEASTERN NEW MEXICO

HOBBS—Humble Oil & Refining Co. 1 Federal-Hobbs, northwest Eddy County wildcat, SE SE 24-20s-24e, was drilling in dolomite and chert below 11,177 ft., following a drill-stem test from 11,073-11,157 ft. The tool was open 88 minutes and recovery was 300 ft. of drilling mud plus 800 ft. of salty water.

In Lea County, Forest Oil Corp. 1 Barnes & Curtis, formerly Vickers Petroleum Co., which was abandoned at 5,316 ft., had new total depth at 9,658 ft. Location is NE NW 26-9s-35e, 2 miles south of Bough field. Top on the Wolfcamp was 9,050 ft. It was drilling ahead.

SOUTHEAST NEW MEXICO WILDCAT FAILURE

Eddy County: H. N. Smith 1 Leeman, 10-26s-24e, dry, TD 675 ft., elev. 3,720 ft., Delaware lime 488 ft., sand 563 ft.

MICHIGAN

Gas Discovery For Missaukee County

MOUNT PLEASANT—Brazos Oil & Gas Co. has completed the 1 Miltner & Shaffer, SE NW 1-24n-7w, Pioneer Township wildcat, Missaukee County, in the Traverse as a new gas discovery in that zone after lower Richfield obective was dry at 4,708 ft. Hole was plugged back to 2,761 ft. and Traverse section, topped at 2,760 ft., was gun-perforated at 2,696-2,712 ft. with 65 shots. This opened section was acidized with 2,000 gal. Well started to show gas following this treatment and has been completed good for 14,500,000 cu. ft., calculated gage.

Brazos has announced two new locations in the area of the gas well discovery, one scheduled to be drilled to the Sylvania at a projected depth of 5,500 ft., and the other set up to test the Traverse section. Both are in Section 26-24n-6w, Norwich Township, Missaukee County, about a mile to the east of this new well.

In Newaygo County, Sun Oil Co.'s 1 Hubbard et al., SE SE SW 19-12n-13w, Garfield Township, showed 1,600 ft. of salt water from the Traverse on a 30-minute drill-stem test at 2,220-32 ft.

The 1 Hubbard et al. is the diagonal southwest offset to Sun's new Traverse oil discovery well at the 1 Wood, NW SW SE 19-12n-13w, where production tests were still being runs. The discovery was being flowed through a highly restricted choke at rates varying from 51 to 60 bbl. of oil a day this week.

The new Newaygo County field will be known as the "Bishop" pool, according to the nomenclature committee of the Michigan Oil and Gas Scouts Association.

MICHIGAN SUCCESSFUL WILDCAT

Missaukee County, Pioneer Township: Brazos Oil & Gas Co. 1 Miltner & Shaffer Comm., SE NW 1-24n-7w, Traverse 2,670 ft., 14.5 million cu. ft. gas, TD 4,708 ft. (dry in Richfield, plugged back to 2,761 ft. perforated 65 shots 2,696-2-712 ft., acidized with 2,000 gal.)

MICHIGAN WILDCAT FAILURES

Allegan County, Watson Township: R. M. Perry & R. E. Bradley 1 Flynn, NE SE SE 7-2n-12w, Traverse 1,546 ft., dry, TD 1,553 ft.

Clinton County, Greenbush Township: Joseph W. Struman 1 Daggett, NE NE NE 12-8n-2w, Monroe 3,021 ft., dry, TD 3,050 ft.

Isabella County, Nottawa Township: Basin Oil Co. and Swan-King Oil Co. 1 Huber, NW SE NE 36-15n-5w, Dundee 3,726 ft., dry, TD 3,743 ft.

Mecosta County, Wheatland Township: Merrill Drilling Co., W. B. Darke 1 Guy, NW SE SW 4-14n-7w, Dundee 3,745 ft., dry, TD 3,756 ft.

Ottawa County, Chester Township: Augie Busk 1 Vander Laan, NE NW NE 15-9n-13w, Traverse 2,173 ft., dry, TD 2,184 ft.

ILL.-IND.-KY.

Kentucky Wildcat Test Swabs 120 Bbl. Per Day

JOE REZNIK and C. P. Chandler 1 Trigg, SW NE NE 21-P-21, promising discovery well located 2 miles south of Smith Mills, northwestern Henderson County, near the Union County line, western Kentucky, swabbed at the rate of 120 bbl. of clean oil per day while starting production tests. Pay zone is the McClosky lime at 2,586-88 ft. with oil string at 2,580 ft. Nearest production is in the Hitesville area, 3 miles to the west. The discovery is rated one of the best within recent months in the general area. Nearest dry hole is more than 1½ miles distant. Pay zone has not been acidized.

In northern Webster County, same state, Sun Oil Co. has completed its 1 Cobb, SW NE NE 22-N-23, to establish another new pool. Located about 1½ miles south of production of the South Poole area, the well pumped 6 bbl. of oil per day. Pay zone, Cypress sand at 2,190-96 ft. (top 2,188 ft.) was shot with 45 qt. of nitro. Hole had been drilled to 2,672 ft. and plugged back to 2,200 ft. The discovery has been designated as the Bald Knob pool.

Opening a new producing area located 6 miles north of Mount Carmel and a mile west of the South Friendsville pool, in Wabash County, Illinois, J. F. Balderson and Paul Waterbury 1 Mundy, NW NE SW 33-1n-13w, has been completed with a pumping production of 135 bbl. of oil daily. Its pay is the Lower O'Hara at 2,657-63 ft. The pay had been given a 6,000-gal. acid treatment.

Another Illinois discovery well, The Texas Co. 1 Harrell, NE NW NE 34-1n-5e, 6 miles south of Iola, Clay County, also has been completed. It pumped 258 bbl. of oil natural with production from the Benoist sand at 2,581-2,604 ft. It is located about ¾ mile northwest of another Benoist sand discovery well completed by the same company several weeks ago.

Productive area of the 5-months-old Peltzer pool, Warrick County, southern Indiana, is being expanded in two directions. V-T Drilling Co. 1 Minnie Addington, NE SE NE 22-6s-8w, a location west of the present most northerly producer, has been completed pumping 5 bbl. of oil daily from the pool's Cypress sand pay zone at 1,550-59 ft. V-T Drilling Co. and C. P. Chandler 2 Tom Helm, SE SW NW 23-6s-8w, east of production, is being put on the pump after swabbing at the rate of 6 bbl. of clean oil per hour. It has the Cypress pay zone at 1,575-83 ft. A southeastward extension also is in prospect at Ashland Oil & Refining Co. 3 Harrison-Powell, SE NW SW 23-6s-8w, where casing has been run to test the pay, found at 1,632-35 ft.

ILLINOIS SUCCESSFUL WILDCAT

Bond County: J. F. Balderson 1 Mundy, NW NE SW 33-1n-13w, IP 135 bbl., Lower O'Hara 2,657-63 ft., TD 2,663 ft.

ILLINOIS WILDCAT FAILURES

Bond County: Mayer Drilling Co. 2 Brown, NE SW NE 30-7n-3w, dry, TD 1,237 ft.

Edgar County: National Associated Petroleum Co. and Continental Oil Co. 1-D Martin, NW NW NE 15-12n-12w, dry, TD 2,037 ft.

Hamilton County: H. H. Weinert 1 Stephens, SW NW NW 16-5s-7e, dry, TD 3,524 ft.

Oil Management, Inc., 1 Leech-Moore, NE NE SE 36-6s-5e, dry, TD 3,450 ft.

Carter Oil Co. 1 Strubinger, SE SW NE 30-6s-6e, dry, TD 3,366 ft.

Jasper County: Ryan Oil Co. 1 Sutherland, NE NE SE 22-6n-9e, dry, TD 3,142 ft.

Fulk & Davie 1 Deimel, NW NW NW 24-5n-8e, dry, TD 3,122 ft.

Lawrence County: T. B. Dirickson 1 Weger, SW NW SE 29-5n-10w, dry, TD 1,583 ft.

Logan County: E. E. Allspach 1 Park, SE NW NE 7-19n-3w, dry, TD 2,078 ft.

Madison County: George Zicos 1-B Sievers, SE NE SW 21-6n-6w, dry, TD 562 ft.
Montgomery County: C. P. Long 1 Bishop, SW SW NW 10-8n-5w, dry, TD 665 ft. C. P. Long 1 Schmidt, NW NE NW 14-8n-5w, dry, TD 705 ft.
Moultrie County: P. Doran Estate 1 Edwards, NW NE NE 11-12n-6e, dry, TD 2,111 ft.
Wayne County: Robinson & Puckett 1 Chaney, SW NE SW 3-1n-6e, dry, TD 3,303 ft.
Nation Oil Co. 1 Simpson, NE SE SE 20-2s-7e, dry, TD 3,448 ft.

INDIANA WILDCAT FAILURES

Gibson County: Perry Fulk 1 Dyer, SW SW SE 34-1s-10w, dry, TD 2,006 ft.
Harry Hanson et al., 1 Chandler, NW SW NE 21-1s-9w, dry, TD 1,452 ft.
Posey County: E. F. Moran and Aurora Gasoline Co. 1 Hagemann-Smith, SW SW NE 7-7s-13w, dry, TD 3,055 ft.
Sullivan County: T & H Corp. and Aurora Gasoline Co. 1 Higbee, SE SE SE 22-9n-10w, dry, TD 2,520 ft.

WESTERN KENTUCKY SUCCESSFUL WILDCAT

Webster County: Sun Oil Co. 1 Cobb, SW NE NE 22-N-23, IP 6 bbl., Cypress 2,188-95 ft., TD 2,672 ft. (Discovery well Bald Knob pool).

EASTERN KENTUCKY

ASHLAND.—In Estill County, 25-P-69, on the east end of Furnace (Deep) gas pool, Jack Kindred et al 2 George Lyle has been shot from 2,690-2,700 ft., not materially helped. At total depth of 2,700 ft., the well is still in the St. Peter sand which had good show of oil although, to date, non-commercial. It is understood that operators will likely drill ahead to check possible additional pay.

In northern Lawrence County, 5-U-82, W. S. Perry et al are drilling 1 Young below 2,100 ft. after finding the Berea sand dry. Operators will likely carry the test into the Corniferous lime hitherto untested in the immediate area:

In Big Sandy gas field, Pike County, Kentucky-West Virginia have completed a good gas well at 5887 P. W. Day. At total depth of 2,816 ft. it made 1,356,000 cu. ft. of gas daily from the Big lime.

OHIO FIELDS

Good Gasser For Knox County

COLUMBUS.—Kinsey and Mossholder 2 R. F. Davidson, Section 19, Jackson Township, Knox County, ½ mile north of their No. 1, logged the upper Clinton at 3,039-61 ft. which filled up 600 ft. with oil, and the lower sand at 3,074-79 ft. with 1,000,000 cu. ft. of gas. The gas dried up the oil and it was turned into the line without shooting either sand. An offset location to the north will probably be started immediately.

A semiwildcat, the W. C. Best 1 Realty Investment Co., Lot 3, Concord Township, Lake County, found the Clinton at 3,518-3,603 ft. with 134,000 cu. ft. on the red sand at 3,522-85 ft. The well was shot, but did not respond and is now being tested. In the north end of the township, J. T. Galey has started an offset on 1 R. H. Woodruff, Lot 48, Tract 4.

Roy Stewart has started two wells in Prairie Township, Holmes County, to offset south and east of his 1 Wengert. Two locations were staked in Tuscarawas County, and two in Meigs, while seven others were scattered over seven additional counties. Fifteen wells were completed, with Ashland field having 4, Mount Vernon 4, and Lancaster 3.

Rising Consumption

(Continued from page 147)

expense of imports is decreasing. Imports by American companies, expressed in refined product equivalents, are expected to be 7 per cent less by volume in 1951 than in 1948, while non-dollar imports will be 37 per cent greater.

Officials estimate the cost of dollar-oil imports by the Marshall plan countries will decline from $440,000,000 for the current fiscal year to $375,000,000 in 1951, although the volume in refined product equivalents will remain approximately equal. This decline in cost is attributed partly to a continuing shift from refined product imports to crude imports and partly to an over-all decline in prices. The cost of non-dollar imports will remain at approximately $622,000,000 despite a 13 per cent increase in volume because of present lower price levels.

"With expenditures on petroleum amounting to so large a part of Europe's dollar deficit and with vital American interests likely to be affected by whatever is done in the field of petroleum outside the United States, ECA has had to use special care in making decisions on the financing of petroleum imports and equipment for use in petroleum expansion," it was declared.

"ECA estimates that participating countries will spend in the 1951 fiscal year on petroleum account—crude oil, refined products and petroleum equipment, as well as all other dollar costs of British company world-wide operations—nearly $700,000,000, or 23 per cent of their dollar deficit.

"In return for this expenditure of dollars—as well as sizable expenditures in other currencies—the participating countries will receive nearly $1,000,000,000 worth of crude oil and petroleum products and will earn $800,000,000 in non-European soft currencies.

"The $700,000,000 is made up of $375,000,000 representing the f.o.b. value of United States company oil imported into participating countries; $148,000,000 for petroleum equipment for use in Europe and outside Europe; and $166,000,000 for the net dollar cost of British company operations in the United Kingdom and outside of Europe, exclusive of equipment."

While a large sum will be spent on petroleum equipment by the Marshall plan countries, it was pointed out, only $5,500,000 has been provided by ECA so far for drilling equipment and refinery maintenance in western Europe and French overseas territories. There has been no ECA financing of drilling equipment for the United Kingdom or for the overseas operations of the British or British-Dutch oil companies.

Refinery expansion.—For refinery expansion, ECA has approved 10 projects, of which 6 are in France, 2 in Italy, and 2 in Britain. Over-all cost is $160,850,000, and ECA will provide $23,782,500. These projects will provide an expanded capacity of 115,000 bbl. per day, only a fraction of the 557,000 bbl. expansion over 1948 which the Marshall plan countries expect to achieve by 1953.

"The procedure which has been adopted for future financing of refinery projects," ECA explained, "provides for review of proposed programs, refinery by refinery and country by country, determining first whether they are economical — that the cost of construction is reasonable, the output well balanced and the cost of operation competitive. The paramount need of the countries to save dollars by increased home refining will be carefully considered in connection with these projects."

Pipe-Line Construction

(Continued from page 270)

Texas Unit II.—Work to start in May; Sinton, Tex., area, 38 miles, 4 to 8-in., contracted to Shanks & Eustace, Inc., Alice, Tex.; Dix, Tex., area, 61 miles 6 to 10-in., contracted to Victoria Oil Field Maintenance Co., Victoria, Tex.

Schedule 7—86 miles of 30-in., Georgia, South Carolina, being started by Williams Brothers Corp. Spread under T. E. Davis; field office, Elberton, Ga.

Schedule 8—102 miles of 30-in., and Schedule 9, 100 miles 30-in., in South Carolina and southern Virginia, contracted to R. H. Fulton & Co.; operations under way in northern South Carolina; A. A. Corrigan, supt.; Clark Williams, general supt.

Schedule 10—86 miles of 30-in., and Schedule 11, 110 miles 30-in., contacted to Smith Contracting Corp.; work under way, R. M. Jones spreadman; field office, Altavista, Va.; to go east to meet spread to be put in field later under C. C. Craig; offices, Herndon, Va.; which will work west from Potomac River.

Schedule 15—24 miles of 30-in., northern end running to Hudson River, under construction; Oklahoma Contracting Corp.; M. E. Shiflett, spreadman; office, Edgewater, N. J.; Omaha Dredge & Dock Co., preparing laying of 30-in. across Hudson River in May.

85 miles, 4 to 14-in., gathering system, South Louisiana; J. B. Latham, superintendent; headquarters, Vinton, La.; Latex Construction Co., contractor.

50 miles, 18-20-in., gathering line, South Louisiana; O. R. Burden Construction Co., contractor.

Trunkline Gas Supply Co.—1,775 miles, 10-26-in., planned; includes 740-mile, 26-in main line from Lake Charles, La., to Tuscola compressor station on Panhandle Eastern Pipe Line Co., and 1,035 miles, 10-24-in. Lake Charles, La., to McAllen, Tex., field lines, pending FPC approval of changed plans.

United Fuel Gas Co.—32 miles, 20-in., authorized; Roane, Calhoun, and Wetzel counties, West Virginia.

United Gas Pipe Line Co.—90 miles, 16-in., planned, West Bay field to New Orleans.

105.6 miles, 20-in., authorized, loop line paralleling Carthage, Tex.-Sterlington, La., and extending on to near Monroe, La.

26 miles in Louisiana conecting with East Texas system, planned.

United Natural Gas Co.—29 miles, 12-in., authorized, laterals, Elk County, Pennsylvania.

Virginia Natural Gas Co.—153 miles, planned, Buckingham to Richmond and Portsmouth, Va.

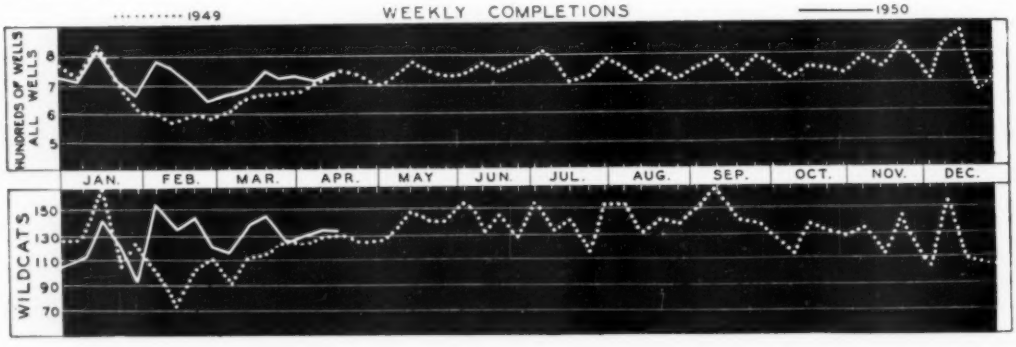
CURRENT STATISTICS

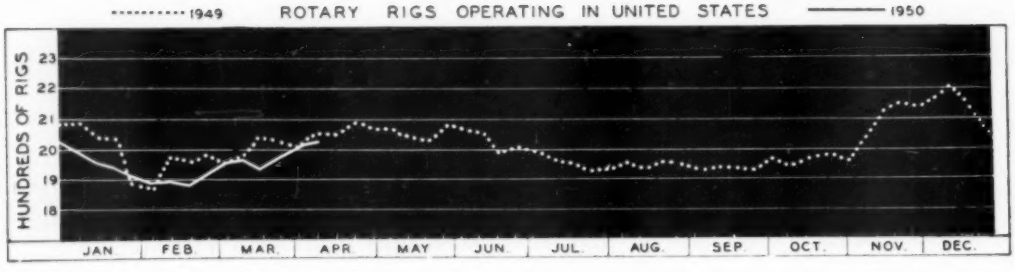
EXPLORATION

WEEKLY WELL COMPLETIONS . . . . . WEEK ENDED APRIL 15, 1950

	Total of all wells					Apr. 15		Wildcat completions and discoveries					Cumulative total, 1950				
	Comp.	Oil	Gas	Dry	Footage	1950	1949	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	9	4	0	*5	13,222	140	306	0	0	0	0	0	0	0	0	0	0
Pennsylvania	17	6	3	8	29,426	315	651	0	0	0	0	0	0	0	0	0	0
West Virginia	10	3	4	3	21,785	169	152	0	0	0	0	0	0	0	4	6	10
Ohio	15	6	3	16	31,379	257	328	0	0	0	0	0	1	0	1	5	7
Indiana	23	7	0	16	41,070	298	299	0	0	0	4	4	9	0	1	48	58
Kentucky	18	7	7	4	31,372	230	230	1	0	0	0	1	5	0	1	16	22
Illinois	30	7	0	23	65,771	609	584	1	0	0	15	16	10	0	0	150	160
Michigan	13	4	1	8	32,390	181	249	0	0	1	5	6	8	0	2	75	85
Kansas	72	42	4	§26	267,332	987	811	0	0	0	13	13	21	0	2	138	161
Nebraska	2	1	0	1	7,604	20	2	0	0	0	1	1	0	0	1	11	12
Oklahoma	94	57	2	135	317,227	1,414	1,084	0	0	0	14	14	41	3	6	182	232
Texas	358	260	11	87	1,560,315	4,327	3,649	13	1	2	44	60	133	11	39	687	869
North Central (Dist. 7-B & 9)	112	65	2	45	329,976	1,354	1,159	4	0	0	19	23	46	2	11	246	305
West (Dist. 7-C & 8)	111	99	0	12	616,805	1,256	801	3	0	0	7	10	32	1	0	148	181
Panhandle (Dist. 10)	16	13	1	2	52,735	296	279	0	0	0	1	1	1	0	2	8	11
Eastern (Dist. 5, 6, & 6-P)	22	19	2	1	89,875	294	283	0	0	0	1	1	3	1	1	71	76
Gulf Coast (Dist. 2 & 3)	46	32	5	9	270,650	582	518	5	0	2	4	11	25	3	13	84	124
Southwest (Dist. 1 & 4)	51	32	1	18	200,274	545	609	1	1	0	12	14	26	4	12	130	172
Louisiana	18	12	3	3	133,708	632	562	1	0	0	1	2	20	5	4	50	79
Northern	10	7	2	1	48,716	327	282	0	0	0	0	0	3	0	1	24	28
Southern	8	5	1	2	84,992	305	280	1	0	0	1	2	17	5	3	26	51
Arkansas	4	2	0	2	12,541	96	76	0	0	0	2	2	1	0	0	25	26
Mississippi	10	6	0	4	80,401	92	100	2	0	0	4	6	4	1	0	32	37
Southeastern States	1	0	0	1	3,311	19	15	0	0	0	0	0	0	0	1	12	13
Montana	0	0	0	0	0	29	56	0	0	0	0	0	0	0	0	8	8
Wyoming	9	7	0	2	46,669	156	157	1	0	0	1	2	4	0	0	22	26
Colorado	1	0	0	1	5,541	17	29	0	0	0	1	1	0	0	0	14	14
New Mexico	10	7	0	3	28,770	185	151	0	0	0	1	1	6	0	0	17	23
California	28	24	0	4	115,875	492	749	1	0	0	3	4	9	0	2	90	101
Miscellaneous	0	0	0	0	0	3	13	0	0	0	0	0	0	0	0	3	3
Total United States	742	462	38	242	2,845,709	10,668	10,352	20	1	3	109	133	272	20	64	1,590	1,946
Total previous week	718	415	45	258	2,622,507			19	0	6	111	136	252	19	61	1,481	1,813
Total April 16, 1949	794	457	59	278	2,799,106			22	3	2	105	132	253	23	49	1,449	1,774

Service wells included: *5, †7, ‡1, §2





DAILY AVERAGE PRODUCTION FOR WEEK

	April 15 crude oil	B. of M. April demand	April 1 crude o.l
Alabama	1,450	1,000	1,250
Arkansas	79,600	83,000	80,900
California	857,200	842,000	859,100
Colorado	57,800	66,000	58,400
Eastern	60,700	60,900	61,000
Florida	1,040	900	1,025
Illinois	178,200	182,000	183,900
Indiana	26,500	27,000	29,200
Kansas	261,950	280,000	256,950
Kentucky	25,200	25,000	26,100
Louisiana	513,200	548,000	511,500
North Louisiana	118,200		116,500
South Louisiana	395,000		395,000
Michigan	43,600	45,000	44,400
Mississippi	94,550	99,000	93,650
Montana	22,900	25,000	22,500
Nebraska	1,450	1,100	1,450
New Mexico	125,800	132,000	125,800
Oklahoma	433,100	415,000	440,150
Texas	1,982,850	2,060,000	1,982,850
Dist. 1 (Southwest)	26,475		26,475
Dist. 2 (Southwest)	118,900		118,900
Dist. 4 (Southwest)	187,700		187,700
Dist. 3 (Gulf Coast)	348,300		348,300
Dist. 5 (Eastern)	30,550		30,550
Dist. 6 (Eastern)	80,250		80,250
East Texas field	258,000		258,000
Dist. 7-C (West)	47,875		47,875
Dist. 8 (West)	601,850		601,850
Dist. 7-B (W. Central)	63,100		63,100
Dist. 9 (N. Central)	130,550		130,550
Dist. 10 (Panhandle)	89,300		89,300
Utah	3,000	1,100	3,100
Wyoming	152,100	136,000	149,200
Total United States	*4,922,190	5,030,000	4,932,425
Change from prev. week, down	10,235		
Canada	65,690		67,170

Total U. S. production January 1-April 15 †519,335,145 bbl.
Same period last year (crude plus cond.) 559,632,000 bbl.

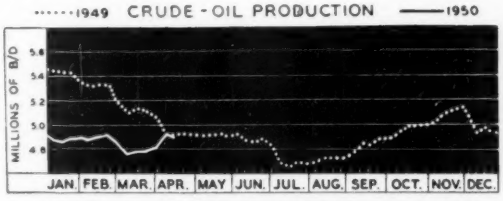
*Not incl. 100,640 bbl. condensate. †Incl. 9,794,645 bbl. condensate.

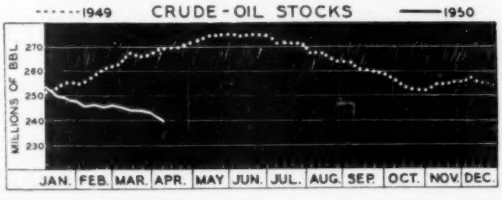
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

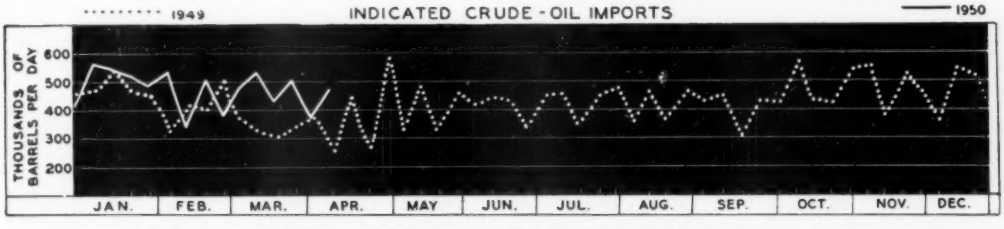
(Thousands of barrels)

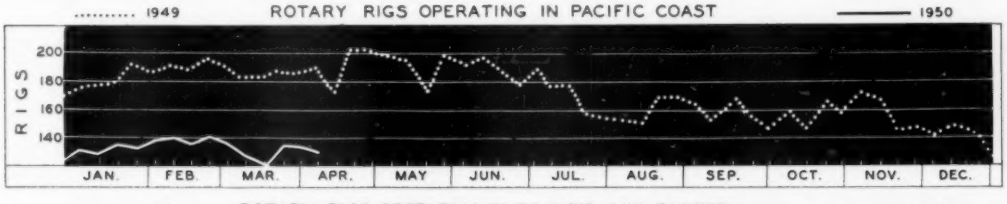
	Apr. 8, 1950	Apr. 1, 1950	Apr. 9, 1949
Pennsylvania Grade	2,817	2,804	3,010
Other Appalachian	1,517	1,591	1,851
Illinois, Indiana, Michigan	9,696	10,205	14,650
Arkansas	3,145	3,368	3,065
Louisiana	15,230	15,992	13,653
North	3,552	3,454	3,715
Gulf	11,678	12,538	9,938
Mississippi	2,347	2,566	2,822
New Mexico	6,642	6,628	7,192
Oklahoma and Kansas	35,098	35,310	38,802
Texas	105,547	107,016	128,953
East Texas	14,528	14,598	18,079
West Texas	37,374	37,876	52,258
Texas Gulf	28,144	28,219	30,153
Other Texas	25,501	26,323	28,463
Rocky Mountain	13,435	13,308	13,173
California	37,838	38,245	33,748
Foreign	6,151	6,074	7,244
Total	239,463	243,107	268,163

*Bureau of Mines.









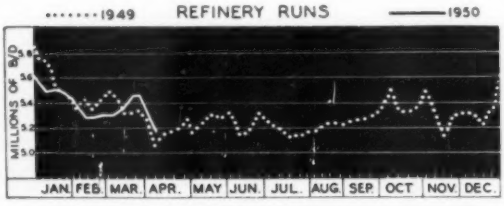
A.P.I. REFINERY REPORT, APRIL 8

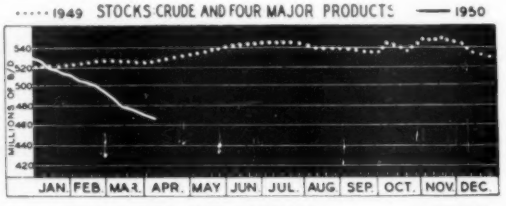
(Thousands of barrels)

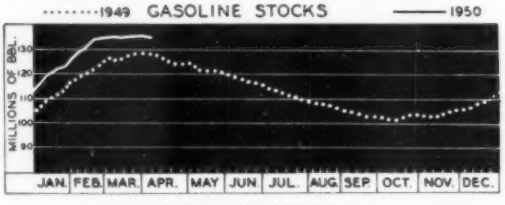
District	Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline†	Kerosine	Distillate	Residual
East Coast	844	350.3	38.0	165.4	254.3	26,372	4,941	10,633	9,344
Appalachian:									
District 1	88	36.0	6.6	11.7	10.1	2,642	262	371	232
District 2	71	35.6	5.6	8.1	15.9	1,060	84	134	157
Ind., Ill., Ky.	910	492.9	55.3	168.6	157.9	28,954	1,932	4,653	2,183
Okla., Kans., Mo.	428	227.9	17.8	88.9	50.0	14,387	363	2,490	652
Inland Texas	197	129.7	12.6	23.4	42.6	3,859	242	755	581
Texas Gulf Coast	1,139	566.4	87.8	213.0	216.4	21,736	1,949	6,221	3,017
La. Gulf Coast	424	236.6	57.4	90.0	56.0	7,525	1,572	2,201	1,956
N. La. and Ark.	66	26.4	8.3	11.7	14.9	3,119	303	525	170
Rocky Mountain:									
New Mexico	12	7.1	.4	2.0	2.9	83	25	74	30
Other Rocky Mtn.	165	72.7	5.6	31.3	31.1	5,331	309	1,299	446
California	826	360.1	12.6	135.6	259.8	20,048	802	8,932	21,726
April 8, 1950	5,170	2,741.7	308.0	949.7	1,111.9	135,116	12,784	38,288	50,494
April 1, 1950	5,470	2,633.1	328.7	928.7	1,131.7	135,586	12,425	38,532	41,041
April 9, 1949	5,067	2,453.7	291.4	915.7	1,136.3	127,522	17,878	48,920	57,920

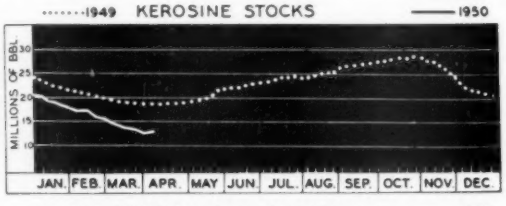
Bureau of Mines, April 1949	Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual
	736	308.3	31.3	137.5	184.5
	86	39.3	4.8	10.5	8.8
	67	33.9	3.6	5.8	16.2
	857	456.5	49.3	125.0	127.0
	394	214.2	22.5	78.3	64.2
	213	143.5	13.5	18.6	47.5
	1,235	616.6	75.1	216.1	220.3
	430	221.7	46.9	93.2	54.9
	73	27.2	6.4	11.8	14.7
	12	6.7	.4	1.6	3.1
	143	60.7	5.0	27.0	35.9
	895	365.8	13.4	120.2	370.1
	5,141	2,494.4	272.2	845.6	1,147.2

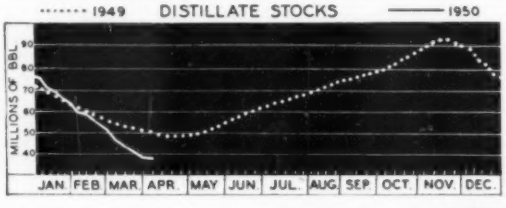
*At refineries including natural blended. †Finished and unfinished.

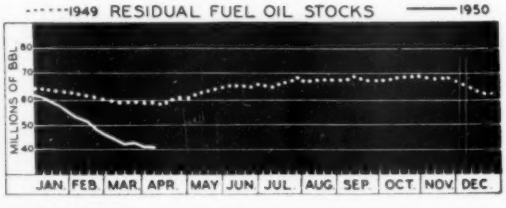


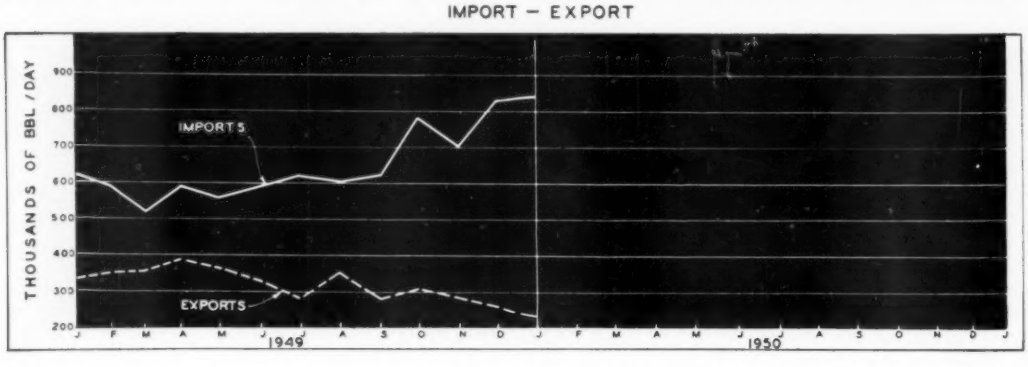












CRUDE PRICES
GRAVITY SCHEDULE

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.53			
19-19.9	1.63			
20-20.9	1.73	$2.25		$2.12
21-21.9	1.82	2.27		2.14
22-22.9	1.92	2.29		2.16
23-23.9	2.02	2.31		2.18
24-24.9	2.12	2.33	$2.56	2.20
25-25.9	2.22	2.35	2.58	2.22
26-26.9	2.31	2.37	2.60	2.24
27-27.9	2.37	2.39	2.62	2.26
28-28.9	2.42	2.41	2.64	2.28
29-29.9	2.48	2.43	2.66	2.30
30-30.9	2.54	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.64	2.49	2.72	2.36
33-33.9		2.51	2.74	2.38
34-34.9		2.53	2.76	2.40
35-35.9		2.55	2.78	2.42
36-36.9		2.57	2.80	2.44
37-37.9		2.59	2.82	2.46
38-38.9		2.61	2.84	2.48
39-39.9		2.63	2.86	2.50
40 and above		2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6 1947. Above changes do not include recent reductions of a few buyers applying principally to low-gravity grades.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

East Texas†	$2.65
Kettleman Hills, California*	2.77
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	3.51
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

GASOLINE demand at Mid-Continent refineries is increasing rapidly. Consumption within the district has shown marked gains as the farming season advances. Shipments to northern marketing areas are up, but most of the improvement represents increased sales to regular customers. Some additional material from inland Texas refineries is available for shipment on a Group 3 basis because dry weather has cut farm demand for gasoline in West Texas. Most of the excess gasoline that is being offered is in the lower part of the normal octane range for regular gasoline and is competing with normal movement on the Mid-Continent spot market.

In general, market inquiries for gasoline are not reflecting the gain in demand. Most marketers have contracts that supply a major portion of their current needs. Some are waiting for additional indications of high summer demands before lining up other supply sources. On the other hand, refiners are moving more than current production with little or no distress gasoline on the market. Increased demand in the coming months will bring more spot activity.

Natural-gasoline prices are firm at the new level with increased movement at 4.5 cents a gallon, Group 3, for grade 26-70.

Residual fuel prices have stabilized at $2.05 per barrel in New York Harbor following the $0.15 increase announced last week by Esso Standard Oil Co. Continuing high demand for heavy fuel indicates that some of the larger users have not gone back to coal even at reduced prices. Total residual demand in the first quarter was about 11 per cent greater than in same quarter last year.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of April 17, 1950. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	$9\frac{1}{2}$-$9\frac{3}{4}$	10.375-10.6	$9\frac{1}{4}$-$9\frac{3}{4}$
Premium gasoline, 86-88 octane	$10\frac{1}{4}$-$10\frac{3}{4}$	11.5-11.6	$9\frac{3}{4}$-$10\frac{3}{4}$
42-44 w.w. kerosine	$8\frac{1}{2}$-$8\frac{5}{8}$	8.8	$7\frac{3}{4}$-$8\frac{1}{2}$
No. 2 straw fuel oil	$7\frac{3}{8}$-$7\frac{3}{4}$	7.6	$6\frac{5}{8}$-7
No. 6 residual	$1.55-1.60	$2.05	$1.60-1.65

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	$4\frac{1}{4}$	$3\frac{3}{4}$	4
Grade 18-55	5.1	4.6	4.85

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	10.5
750 vis., No. 3-4 neutral	12.75
2,000 No. 5-6 neutral	14-14.5

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	17
200 vis., No. 3 neutral, 0-10 pp.	11.5-12.5

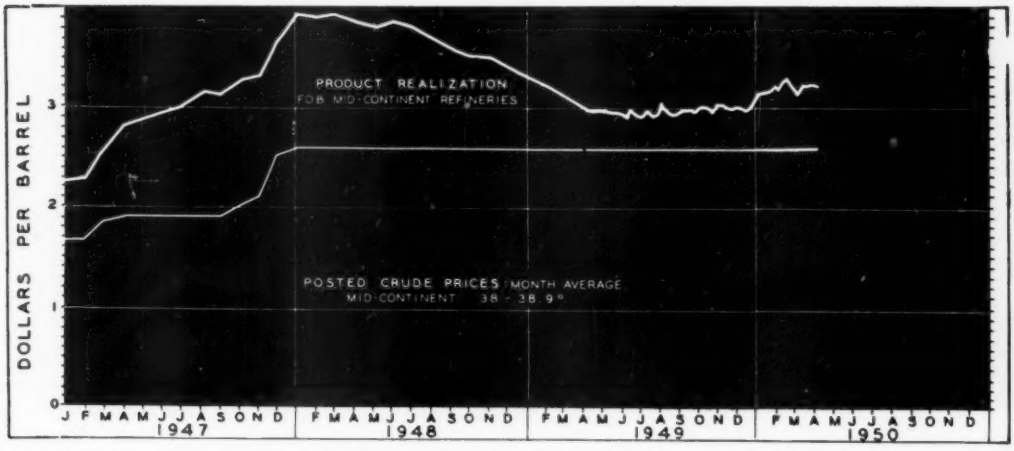
Western Pennsylvania

145-155 vis., 10 p.t. bright stock	19.5-20.5
180 vis., 0 p.t. neutral	20.5-21.5

WAX

Mid-Continent

132-134 A.M.P.	4.50


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
POSTED CRUDE PRICES 1 MONTH AVERAGE
MID-CONTINENT 38 - 38.9°
DOLLARS PER BARREL
0
1
2
3
J F M A M J J A S O N D
1947
F M A M J J A S O N D
1948
F M A M J J A S O N D
1949
F M A M J J A S O N D
1950

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil

EQUIPMENT MEN . . . in the News

Western Supply Elects Hughes as Vice President

J. E. HUGHES

James E. Hughes has been elected vice president of Western Supply Co., of Tulsa, according to F. W. Dye, president. Hughes has been associated with Western since 1946. Prior to joining Western, Hughes was associated with Phillips Petroleum Co. in the engineering department and in licensing Phillips patent structure. Western, a member of the Tubular Exchanger Manufacturing Association, has expanded its sphere of heat-transfer coverage to embrace all phases of petroleum processing and product, crude and natural-gas transmission.

Hughes has brought a complete complement of chemical and mechanical engineers into the engineering, manufacturing, and sales end of Western's heat-exchanger operations. In addition to its main office and plant in Tulsa, Western has sales offices in Houston, and is represented in San Francisco by Trident Engineering Co.

Somervell Named Koppers Board Chairman

Brehon Somervell, president of Koppers Co., Inc., since May 1946, has also been named chairman of the company's board of directors. His election came at the annual meeting of the board following the retirement of J. P. Williams, Jr., as company chairman. Williams was elected to the presidency of Koppers Co. and as executive vice president of Koppers United Co. in 1939. From 1944 to April 1946, Somervell became president, he served as president and chairman of the board of the present company. W. F. Munnikhuysen, who has been vice president and general manager of the company's wood-preserving division, was made executive vice president of the company. He has at various times been connected with three of the company's six divisions and has a wide knowledge of operations. Stockholders also elected two new members of the board of directors. The new members are Munnikhuysen and Joseph Becker, vice president and general manager of the engineering and construction division. Becker's connection with Koppers began in 1910. He has been chief executive of the engineering and construction division since 1925.

Beacon Petroleum Opens New Houston Office

H. R. McFARLAND

Beacon Petroleum Co., of Tulsa and Chicago, has announced the opening of a Houston office to give better service to its suppliers and customers in the Southeast and Southwest. H. R. McFarland, vice president of Beacon, is moving to Houston and will be general manager of the office there. Beacon Petroleum is now operating in virtually all states east of the Rocky Mountains and in Canada. With a Houston office Beacon will now have adequate coverage in the gulf area. J. S. Feroe is president of the company and R. E. Bolinger is vice president and treasurer.

Glitsch Names Tunno to Head New Tulsa Office

J. J. TUNNO

Fritz W. Glitsch & Sons, Dallas refinery bubble-tray and tower manufacturer, has announced the opening of a direct sales office in Tulsa with Julian J. Tunno as district sales manager in charge.

Tunno, an electrical engineer graduate of Purdue University, worked for Babcock & Wilcox as a methods engineer for 3 years before joining the Glitsch organization.

Pipe Line Engineering to Represent Telematic Corp.

Telematic Corp., of Chicago, has announced the appointment of Harry H. Tinch, president of Pipe Line Engineering & Equipment Co., Houston, and his organization, as sales representatives in Texas. Telematic manufactures remote-reading liquid-level gaging equipment for oil storage.

Phil A. Cornell Opens New Rental Yard at Alice

General offices of Phil A. Cornell & Co. located at Oklahoma City.

Phil A. Cornell & Co. has announced the opening of its new rental yard at Alice, Tex. Cal Brougher is in charge of the new unit. The company has four other yards located at Oklahoma City and Duncan, Okla.; Odessa, Tex., and Casper, Wyo.

Cornell does a strictly rental business featuring rotary drilling and production equipment. President of the company, Phil A. Cornell states that "the steady growth of the rental business indicates a trend among operators to rent their equipment."

Texas-Southern Acquires O. C. Whitaker Co.

Formal announcement has recently been made that Texas-Southern Contracting Co. has acquired O. C. Whitaker Co. and will continue in the pipe-line construction business with the same experienced management, equipment, and field organization. O. C. Whitaker Co. was a charter member of the Pipe Line Contractors Association and has been active in the field of pipe-line construction for many years.

ROBERT THOMAS

I. C. LITTLE

I. C. MINYARD

J. C. BRISCOE

President of Texas-Southern Contracting is Robert Thomas, formerly associated with O. C. Whitaker Co. I. C. Little, Sr., of Dallas, is vice president, and J. C. Briscoe, also formerly with O. C. Whitaker, is vice president and secretary-treasurer. J. C. Minyard is general superintendent and is widely known for his experience in pipe-line construction. First contract on which the new company started work is for the construction of 92 miles of 30-in. line, designated as Section D, from the Sabine River to Porters, Tex., for Transcontinental Gas Pipe Line Corp.

Eastman Oil Well Survey Makes W. L. Somner Agent

W. L. Somner Co., Inc., has been named exclusive agent for Eastman Oil Well Survey Co., in Brookhaven and Tinsley, Miss., and Shreveport, La. W. L. Somner is president of the company, and H. G. Lawrence is general sales manager of the Louisiana concern. Their representation of the Eastman company in that territory will include the rentals of Eastman single-shot and drift-indicator instruments and casing rollers. Eastman directional-drilling services and oil-well surveys are also available through the firm, with experienced Eastman field engineers directing and performing the work.

Metal Goods to Distribute Childers Jacketing

Metal Goods Corp. has been appointed the exclusive distributor for Childers Aluminum weatherproof jacketing in the Midwest and Southwest areas, it has been announced by R. A. Childers, president of Childers Manufacturing Co. The finished jacketing is packaged in 100-ft. rolls, ready for use over molded pipe insulation. It can be attached by aluminum bands, special plastic tape, or sheet-metal screws. Metal Goods offices and warehouses are located in St. Louis, Houston, New Orleans, Dallas, Denver, Kansas City, and Tulsa.

Gaso Pumps Names Lufkin Agent in Western Canada

Gaso Pump & Burner Manufacturing Co., Tulsa, has announced the appointment of Lufkin Machine Co., Ltd., as its exclusive distributor in western Canada. Offices and warehouse of Lufkin are located in Edmonton, Alta., where a complete stock of Gaso pumps and repair parts will be available for the oil industry in that area. The Edmonton office will be in charge of Charles E. Dyer. Since 1933 Dyer has been associated with Lufkin's parent company, Lufkin Foundry & Machine Co. of Lufkin, Tex.

C. E. DYER

Gaso has been furnishing pumps for the oil industry in Canada for the past 16 years and has more than 200 in service in that area. Repair parts for all of these pumps will be carried in stock by Lufkin Machine Co., Ltd., at Edmonton.

Perforating Guns Atlas Announces Two Promotions

F. L. TUCKER

G. E. THOMPSON

Two men have received important promotions in Perforating Guns Atlas Corp., according to an anouncement by Paul Charrin, president.

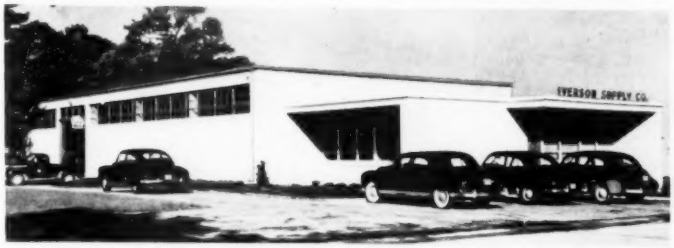
Frank L. Tucker takes over as manager of service and operations. He has been with the company since 1938. Before that he was with the Reed Roller Bit Co.'s sales and service departments for 4 years.

George E. Thompson now steps up to sales manager. He joined Perforating Guns in 1943. He has been associated with perforating companies since the inception of electric gun perforating in the Gulf Coast area. Promotion of the company's jet and bullet perforating services, as well as the sale of its gamma-ray logging and its recently announced atomic neutron-logging facilities, will be handled by Thompson. He will also be in charge of the sale of its Baker wire-line bridge plug and packer services.

Denver C. of C. Invites Industry Through Ads

"Open your office in Denver and enjoy the world's finest climate," is the invitation being sent out to oil men by the famous mile-high capital city of Colorado. A series of advertisements reminding oil men that Denver is the major metropolis of the vast Rocky Mountain oil empire is being run in The Oil and Gas Jour-

Iverson Enters Gulf Coast With Houston Headquarters



Iverson Supply Co. has expanded its sales and service operations to cover the Gulf Coast area by opening this new division office and warehouse in Houston. The plant will carry a complete stock of drilling, production, and refinery equipment. R. B. (Bob) Yanaway, division manager of the Gulf Coast area, will direct the activities of these new facilities. Other Iverson outlets are at Tulsa, Okmulgee, Oklahoma City, Okla.; Salem, Ill.; Artesia, N. M.; and Kermit, Odessa, and Snyder, Tex.

nal. Other industries and businesses are being invited to Denver through advertisements in various trade journals. More than 70 oil-producing companies are now located in Denver including branches of Carter Oil Co., Gulf Oil Corp., Sun Oil Co., Shell Oil Co., and Continental Oil Co.

Acid Engineering Firm Announces Incorporation

Acid Engineering Co. of Kansas has been incorporated and is now known as Acid Engineers, Inc., with headquarters at Lakin, Kans.

Officers of the new firm are E. S. (Jack) Villines, president and general manager; W. D. Ash, vice president; R. A. Sabo, vice president; and Leslie G. Stullken, secretary-treasurer.

The company operates oil and gas-well chemical services in Hugoton gas field in Southwest Kansas and is licensed under Dow acidizing patents.

First Big Incher Bought By Eastern Construction

Eastern Construction Co., Inc., Dallas, has purchased the first "Big Incher" built by Unit Rig & Equipment Co., Tulsa, for Crutcher-Rolfs-Cummings, Inc., Houston.

Slated to start work at Henderson, Tenn., on a 155-mile, 22-in. line for Midland Valley Pipe Line Co. from Henderson to Russellville, Ky., this 35-ton machine is the largest wheel-type ditch digger ever built, cutting a ditch approximately 52 in. wide and 8½ ft. deep. It includes hydraulic features that have never been used on this type of machine before.

Unit Rig announced plans to make all C.R.C. ditch-digging machines. C.R.C. is the largest dealer in the country for these machines. Unit Rig officials pointed out that this new development would not curtail production of the company's regular line of equipment for the oil industry.

Huber to Manage Roebling's Wire Rope Division

W. A. HUBER

Charles R. Tyson, president of John A. Roebling's Sons Co., has announced that Walter A. Huber has been appointed general manager of the wire-rope division. According to Tyson, the appointment is part of a plan to decentralize the company's various divisions. The objective of the new program is to specialize each product division for more production efficiency and better service to customers.

Huber will coordinate administrative and production work with merchandising schedules and customer requirements. The wire-rope division, which he is taking over, is one of the company's most important operations and one for which it is best known.

Huber, for the past 9 years, has served as manager of preformed wire-rope sales for American Chain & Cable Co., Inc., and prior to that had served as assistant to the president and sales manager of the wire-rope division of Jones & Laughlin Steel Corp.

OB Appoints Core Lab as Distributor for Mud Guns

Core Laboratories, Inc., Dallas, has been appointed exclusive distributor for OB Mud Guns domestically, east of California and in Canada. Manufactured by Oil Base, Inc., Compton, Calif., these guns are available in three models, for top-hole and bottom-hole mixing.

Distribution in California will be handled from present Oil Base, Inc., warehouses in Compton, Ventura, and Bakersfield.

Mud Products, Inc., of Tulsa, will continue to distribute OB mud guns as standard equipment on all-welded steel suction pits which it fabricates for mud systems throughout the Mid-Continent and Gulf Coast areas.

Bilbey Placed in Charge of McCullough Fishing Tools

CHARLES BILBEY

Charles Bilbey is in charge of fishing-tool service for McCullough Tool Co.'s Canadian branch in Edmonton, Alta., according to an announcement by I. J. McCullough, president. Bilbey, an expert fishing-tool man, has been actively engaged in fishing-tool service for over 15 years. More than 13 of these years were with drilling contractors and 2 years with McCullough at Bakersfield, Calif.

Continental Opens New Shreveport Facilities

Continental Supply Co. has opened its new district office, store, and warehouse building in Shreveport. The building combines the finest architecture and materials available with every device for employe comfort, including air conditioning and central heating. The office building is of concrete and brick, and is completely fireproof. The warehouse is a structural-steel building and is equipped with a 25-ton overhead crane capable of handling the largest equipment in the oil country.

Continental Supply, which is a subsidiary of Youngstown Sheet & Tube Co., has 75 stores in the United States and Canada, and carries on extensive operations in the export field. The Shreveport store, one of the first three to be opened by the company, has operated continuously since 1913. For the past 21 years, E. N. Wood has been Continental's district manager in Shreveport.

The barbecue dinner served at opening ceremonies was attended by Walter E. Watson, first vice president; J. L. Mauthe, vice president of Youngstown Sheet & Tube, and by many Continental Supply officials including F. M. Mayer, president; W. J. Morris, chairman of the board of directors; N. A. Endicott and D. M. Bailey, vice presidents; C. L. Vickers, treasurer; J. A. Mussler, general sales manager; C. N. Swanson, director of purchases; and Continental personnel from all over the district.

(Continued on page 308)

On a trial run, the Big Incher ditch-digging machine is shown making its first cut.

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

CLASSIFIED ADVERTISING

UNDISPLAYED CLASSIFIED 12c a word one issue. 10% Discount three or more issues. $3.00 minimum charge. Blind Box in our care counts nine words. Payable in Advance.

DISPLAY CLASSIFIED
$12.00 a column inch one issue . . .
10% Discount three or more issues.

EQUIPMENT FOR SALE

FOR SALE: 1—36-L Bucyrus Rig, 1948 model, complete with all tools. Phone 2032, Henderson, Kentucky.

SEISMOGRAPH EQUIPMENT FOR SALE: Two 2-Ton Chevrolet Coleman 4-Wheel Drive water trucks, 500 gallon tank completely winterized, vacuum fill, Tulsa winch, etc. Excellent condition, low mileage. Original Cost $6600.00 — Sale Price $4000.00.

One ½-Ton Chevrolet crew and field service unit. Bed enclosed with steel, cab with heater, 65 gallon gas tank with gear pump. 7:50 x 15 tires. Low mileage. Original Cost $2800.00—Sale Price $1800.00. Riverside-6811, Dallas, Texas.

BOILERS FOR SALE: 18 Code Oil Field Boilers, 50 to 87 H.P., 100 to 200 Lbs. W.P., Operated under Hartford into 1948, not fired since. Located on Leases vicinity Pampa, Texas. Offered subject to prior sale $500.00 to $700.00 Each, as is where is. Contact W. L. Godfrey or Max Harbison, Kewanee Oil Company, Pampa, Texas.

Several Army Surplus 4½" x 6" Gaso Duplex 1860 Pumps — two piece skid mounted with Chrysler 8 cylinder engines. Will sell pumps only or complete units about half price.

H. H. COFFIELD
ATTN: W. H. Orr
Phone: 132—Rockdale, Texas
A-81084—Houston, Texas

PACKAGED H_2S REMOVAL UNITS

We offer prompt shipment on skid-mounted hydrogen sulfide removal units for treating sour gas for pipe line or fuel gas purposes.

GRAFF ENGINEERING & EQ'PT. CO.
3415 Westminster, Dallas 5, Texas

50,000 ft.—1¼" new extra strong seamless steel pipe, random lengths, plain end

GUARANTEED USED SEAMLESS STEEL BOILER TUBING

50,000 ft.—1½" O.D., 9 gauge
120,000 ft.—2" O.D., 10 to 11 gauge
150,000 ft.—2¼" O.D., 10 to 11 gauge
60,000 ft.—3¼" O.D., 9 gauge
45,000 ft.—3½" O.D., 10 to 11 gauge
20,000 ft.—3½" O.D., ⅜" wall
25,000 ft.—4" O.D., 9 gauge
60,000 ft.—5⅜" O.D. and 5½" O.D., 8 gauge

All of our used tubing is cleaned and tested for 850# hydrostatic pressure

15,000 ft.—6" O.D. guaranteed used welded steel pipe, ⅛" wall, plain end
10,000 ft. 6⅝" O.D. guaranteed used standard seamless steel pipe, 19#, plain end

GUARANTEED USED LAPWELD STEEL PIPE, PLAIN END

12,000 ft.—8⅝" O.D., 24#
9,000 ft.—8⅝" O.D., 28#
6,000 ft.—10¾" O.D., 40#

2,000 ft.—12¾" O.D. guaranteed used Naylor spiral weld steel pipe, 7/32" wall

We carry large quantities of both new and guaranteed used steel pipe and tubing up to 36" in diameter.

Your inquiry will be appreciated.

A. GREENSPON PIPE CO., INC.
3615 Olive St. St. Louis 8, Mo.
LUcas 5651

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

REBUILT BOILERS

150 HP Walsh-Weiden Water Tube Type, Complete with standard trim. Peerless Boiler Company, 421 North Cincinnati, Tulsa; 2015 NE Park Place, Oklahoma City.

FOR SALE: 1—1944 Model LMSWM Mack Tandem with NH-600 Cummins Diesel engine, Brown Lipe with Power Tower, 11.00 x 24 rear tires, 14.00 x 24 front tires, Garrison power steering, heavy duty oil field bed and winch, has gin pole lifts. Good Condition. Commercial Truck Company, 713 Texas Avenue, Lubbock, Texas. Phone 4380.

FOR SALE
NEW—50% TO 75% LESS THAN REPLACEMENT COST
EXPLOSION PROOF

Motors & Controls — Conduiets
Flowrators 3"—$60.00 — Telephones—$110.00
Power Weighing Scales — Lights—$35.00
Side Entering Mixers 25HP—$200.00
Vapor Steam Generators—$250.00
Simpson Mixers, Pumps, Valves, Meters, Filters, Gas & Oil Hose.

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Phone: AR 6-8050

ELECTRIC MOTORS

	H.P.	VOLTS	PH.	CYC.
1 West.	15	440	3	60
1 U. S.	25	440	3	60
17 West.	25	440	3	60
7 West.	30	440	3	60
7 West.	40	440	3	60

These motors have been reworked, rewound, and are in good condition.

50% of new price.

For prices and details write:

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Corpus Christi, Texas

FOR SALE

25,000' 2" Non-Upset 4.6# New Seamless J-55 Range 2 Tubing, $35.00 Cft., FOB Pittsburgh, Pa.

40,000' 4" OD New Invasion Pipe 4½" OD Ends Grooved for Victaulic Couplings. All 20' Lenghts. $25.00 Cft., FOB St. Louis, Mo.

Other Sizes Line Pipe and Casing Available. For Prices Contact

A. J. STRUBEL
Sidney 1791 5050 Pernod
St. Louis, Mo.

EQUIPMENT FOR SALE

ONE new 40' x 40' x 12' corrugated aluminum building; double sliding door; single door and window; steel structure. Located: Bunkie, Louisiana. Anchor Gasoline Corp., Phone 54-5201, Tulsa, Oklahoma.

WAR SURPLUS MACHINERY

Gaso, Byron Jackson, Aurora, Wayne, Lombard, & Hale Fire Pumps with Engines, 1½ to 25 KW Generator Sets or Light Plants, Engines, Suction Hose, Fire Hose, Victaulic Couplings & Etc. Write for listing. H. A. McCarthy, 310 Thompson Bldg., Phone 5-3296, Tulsa, Oklahoma.

FOR SALE—127' "Oilwell" Drilling Mast, 515,000 capacity, complete with six-foot substructure. Call or write H. Waggoner, Phone 64-1413, or P.O. Box 4657, Oklahoma City, Okla.

FOR SALE: 5½ Keystone, complete with all tools, in good shape; two trucks and two shallow producing wells in center of 640 acres. Shallow wells fully equipped and pumping. Inland Oil Co., 1940 Mentor, Wichita, Kansas.

FOR SALE
5—Used "Caterpillar" D13000 Power Units with Gaso Model 1742 5x10 pipeline pumps, complete with skids, V-belt drive, and guard—Immediate Delivery.
JOHN FABICK TRACTOR COMPANY
3100 Gravois, St. Louis, 18, Mo.
Phone: Laclede 8900. L.D. 5

Rig For Sale

Model G-300 EMSCO Draw Works powered by 2-R61 Climax Motors (Compounded) with 150 H.P. Each, 300 H.P. on Draw Works and one pump.

127' Lee C. Moore Jackknife (Thribble) Derrick with 5 Sheave Crown. (API Load Rating of 450,000 Lbs.)

7' Sub-Structure with extension on floor, Guard Rails, and Steel Steps.

1—7¼ x 12 Gardner-Denver Pump Powered by Draw Works Motors.

1—5x10 Gardner-Denver Standby Pump Powered by 85 H.P. Climax Motor. (Pumps Unitized for Easier Moving)

150 Ton BJ Triplex Hook
4 Sheave 150 Ton Bethlehem Block
1—6 Gumbo Buster Swivel
17½" API Bethlehem Rotary
Light Plants
Cameron Mud Gauges, Unitized Mud Lines, 2 Chicksaw Mud Guns, Tex La Mud Hopper, Mud Weighing Instruments, and Filter Press.
Steel Tool House
Cameron Mud Valves Throughout on Manifolds
All Steel Hi Pressure Connections; Unitized
American Shear Relief Valve
Various Tools
All Necessary Hand Tools

The above rig is equipped for use with butane or natural gas. This rig has not been used much and is in excellent condition.

Price $37,500.00

Phone: Alice, Texas, 945
Address: P. O. Box 1045, Alice, Tex.

EQUIPMENT FOR SALE

3200' 5 9/16" 22# Range 2 Drill Pipe with Reed shrink grip full hole tool joints. Pipe and joints in A-1 Condition. Will sell or trade right. Two 110 HP 250# oil well Locomotive type boilers. Boilers practically new, used only a short time. Can be operated at full pressure. Priced right. P.O. Box 1517, Pampa, Texas. Phone 3957.

6—Guaranteed used horizontal welded steel tanks, 8' in diameter, 32' long, 5/16" wall, bulged heads

1—NEW heavy welded steel tank, 7'6" in diameter, 13'6" long, approx. 5/8" shell, 3/4" bulged heads

3—NEW vertical welded steel tanks, bulged heads, 4'8" in diameter, 18'8" high, approx. 1 1/2" thickness, with stands

20—Guaranteed used vertical welded steel tanks, 10'4" in diameter, 17'4" high, approx. 3/8" wall, dished heads, manhole on side, complete with iron stands—DOUBLE COATED ON INSIDE WITH GUSMER'S MAMMUT—LIKE GLASS ENAMEL. (Can also be used horizontally).

100—New and Guaranteed used A.P.I. bolted type steel tanks from 250 bbl. to 10,000 bbl. inclusive.

50—New and Guaranteed used welded and riveted steel tanks up to 74,000 bbl. capacity.

150—Guaranteed used closed vertical Cypress WOOD tanks, approx. 10' in diameter, from 8' to 18' high, complete with round hoops and lugs.

Your inquiry will be appreciated.

A. GREENSPON PIPE CO., INC.
3615 Olive St. St. Louis 8, Mo.
LUcas 5651

EQUIPMENT FOR SALE

USED ROTARY AND CABLE TOOL DRILLING TOOLS. WIRE LINES. E. A. KELLY. BOX 861, OKLAHOMA CITY. PHONE 5-6407.

FOR SALE: Two steel mud tanks, 5 feet by 8 feet; 30 feet long, made of 1/4" steel, sloping bottom. Never been used. $2,500.00. Located Makin Drilling Company's yard, Hobbs, New Mexico.

FOR SALE: 87' Lee C. Moore Jack-knife derrick, 6'-8" X 36' substructure, floor extensions, hand rails, near Corpus Christi, Texas. Price $7,000.00. Falco Drilling Company, Alice, Texas.

1 COMPLETE U-10 Unit rotary rig w 3 compounded D13000 engines, 126' mast, 6' substructure, blowout preventor. Fully equipped to start drilling. Equipment in A1 condition. Located at Newcastle, Wyoming. For information contact Kiowa Drilling Company, Inc., 717 Union National Bank Building, Wichita 2, Kans. Telephone 3-8013.

FOR SALE
(SUBJECT TO PRIOR SALE)

3 Bolted tanks, 2 in original crates and one assembled, (100 Bbl.). 69'-14" 57# Drive Pipe; 170'-10 3/4" 41# Drive Pipe; 407'-10 3/4" 32.75# Casing 8Rd. Thd. Smls.; 3045'-8" 24# Casing 8Rd. Thd. Smls.; 6286'-7" 23# Casing 8Rd. Thd. Smls.; 8101'-3" 9.20# Tubing Smls.; 1453'-2 1/2" Tubing EUE Smls.; 14,226'-2" 6.40# Regular 10Rd. Thd.; 375'-3/4" Pumping rods; 9-5" Orbit Gate Valves; 9-3" Orbit Gate Valves; 3-2" Orbit Gate Valves; 3-2 7/8" x 6' Parmco Combination Packer; 1-2 7/8" x 6' Larkin Screw Trip Packer; 1-3" x 6" Parmco Packer; 1-2 7/8" x 6" Gas Anchor Packer. M. B. Belden Office at 425 2nd St. N. W., Canton 2, Ohio. Phone 4-6147.

EQUIPMENT FOR SALE

FOR SALE: One, type-100 National Drilling Rig has drilled only two wells. With 800,000 pounds capacity jack-knife derrick. Box D-448, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Grinding machines for reclaiming used stainless steel ball valve seats from 3/4" to 2 1/4" Ball sizes. Save 75%. Write for details. The Ball Valve Seat Grinder Co., 102 Jamesville Rd., DeWitt, New York (suburb of Syracuse).

SKID MOUNTED Double Drum Spudder, 6500 foot capacity, double mast with or without tools. Bargain. Box D-457, The Oil and Gas Journal, Tulsa, Oklahoma.

CARDWELL RL SPUDDER. Completely equipped. Good operating condition. Located Central Oklahoma. For prices and terms write: Barnes Drilling Company, 22 West Fourth St., Tulsa, Oklahoma.

1—5" x 8" FD-FXX Gardner-Denver Power Pump; 1—5" x 8" FD-FXX Gardner-Denver Power Pump mounted on skids with PA-100 International engine. Chapman Pipe & Supply, Box 4232, Oklahoma City, Oklahoma.

ONE Skid mounted 5 x 10 Gardner Denver Pump with 525 Buda Engine used to drill five shallow holes—$3000.00. Riverside-6811. Dallas, Texas.

40,000'—6 5/8" OD, 17.65#, seamless, range 3, beveled, 80c; 60,000'—6 5/8" OD, 19.79#, T&C, range 1, 80c. All above No. 1 grade. P.O. Box 1858, W. C. Berry, Tulsa, Oklahoma.

EQUIPMENT WANTED

INTERESTED in small portable double-mast rig, capable of drilling to approximately 2000 feet, with or without drill pipe. Equipment must be in good condition and reasonably priced. Preferably located in Southwest Texas. Contact:

MAKIN DRILLING COMPANY
Box 131, Hobbs, New Mexico, Phone 131

WANTED

Hyster Winches Towing or Worm Drive Models D8N — D7N — D6N and D4N.

JOHN FABICK TRACTOR COMPANY
3100 Gravois, St. Louis, 18, Mo.
Phone: Laclede 8900. L.D. 5

HELP WANTED

WANTED! Salesmen in essential areas to call on production superintendents. Write for particulars. The Ball Valve Seat Grinder Co., 102 Jamesville Road, DeWitt, New York (Suburb of Syracuse).

WANTED: Superintendent for High Pressure Absorption Plant. Give operational and educational background, age, and salary expected. Box D-451, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED
Assistant Superintendent for Petro-chemical Plant. Chemical Engineer with at least ten years operating experience in petroleum refining or petrochemical plants. Box D-453, The Oil and Gas Journal, Tulsa, Oklahoma.

TANKS FOR SALE

8—55,000 bbl. 5 ring, complete shell and bottom only, riveted, 140 tons, plates 6'x20', rivets backed out, match-marked, loaded on cars, $6500.00 each.

3—77,000 bbl. 7 ring, riveted, shell and bottom, 3/16" welded roof, 250 tons, steel 6'x18' sheets, rivets backed out, match-marked, loaded on cars, $10,500.00 each.

P.O. Box 1858 W. C. BERRY Tulsa, Oklahoma

NOW IN PROGRESS
OUR LATEST LIQUIDATION

100 OCTANE GASOLINE REFINERY
Located at Cotton Valley, La.

Equipment in Unusually Fine Condition
Complete Listings Available On All Items:

Tanks, Towers and Vessels
Pumps, Turbines and Motors
Heat Exchangers and Condensers
Laboratory Equipment
Pipe—Valves and Fittings
Boilers
Instruments and Controls

WRITE — WIRE — PHONE

DULIEN STEEL PRODUCTS, INC.
of Washington
P. O. BOX 667
COTTON VALLEY, LA.
PHONE: COTTON VALLEY 26

ESTIMATOR

Experienced ENGINEER familiar with Oil Refinery design and capable of estimating process equipment from flow diagrams.

Give full information, experience record and salary expected.

ARTHUR G. McKEE & CO.
2300 CHESTER AVE.
CLEVELAND 1, OHIO

HELP WANTED

FOREIGN and Domestic Oil Employment Directory (including late supplement of oil companies and drilling contractors in Western Canada). Over 500 listings in drilling, production, refinery, natural gasoline, pipelines, geological, exploration, supplies, manufacturers, services and refinery and pipeline contractors, showing where to apply for jobs. Price $5.00. Oil Industry Mailing List, Box 2603, Tulsa, Okla. (Our 30th year)

SITUATIONS WANTED

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 131, Ph. No. 131, Hobbs, New Mexico.

REGISTERED CHEMICAL ENGINEER, ten years broad experience natural gasoline, LGP, plant operation, estimates, purchasing, design, some construction; four years army officer; now plant superintendent; wants change. Resourceful, cost-conscious, cooperative. Age 38, family. Box D-444, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE PETROLEUM ENGINEER: 13 years experience, drilling, completion, production, and work-over, Mid-Continent and Gulf Coast areas. Box D-431, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINING AND PRODUCTION MATERIAL MAN, experience in Auditing, Inventory, Control, Lease Mapping, Purchasing and Sales. Can furnish the best of references. Age 35. Box D-450, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT - Office Manager - Auditor desires connection with independent oil company that would appreciate a fully qualified middle aged man who is presently employed. Box D-456, The Oil and Gas Journal, Tulsa, Okla.

TWENTY YEARS' EXPERIENCE compressor station, gasoline plant and field construction, operation and management. Desire project management position. Have had production experience. Presently employed. Box D-461, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Petroleum Engineer with 2 years production experience; 2 years as service company engineer. Excellent references. Box D-460, The Oil and Gas Journal, Tulsa, Oklahoma.

PIPING SUPERVISOR: 15 years' construction experience in oil refineries and gasoline plants. Age 35, married, sober, not afraid of responsibility, hard work or long hours. Availabe for construction or maintenance, U. S. or foreign. Jim O'Connor, 1300 Orleans, Beaumont, Texas.

CORROSION ENGINEER—Thoroughly experienced in oil refineries and in application of Cathodic Protection, desires change. Box D-462, The Oil and Gas Journal, Tulsa, Oklahoma.

B.S. IN Petroleum Engineering with some graduate work in reservoir engineering, now employed as structural designer, desires employment in production or cycling plant field. Box D-464, The Oil and Gas Journal, Tulsa, Oklahoma.

PATENT ATTORNEYS

PATENT Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommell Registered Patent Attorneys, Suite 418 815-15th Street, N.W., Washington 5, D. C

OIL LOANS

OIL PRODUCTION LOANS

$100,000 or More

Insurance Company Money

HALL INVESTMENT COMPANY

224 East 4th St.—Tulsa, Okla.

Phone 2-6167

ROYALTIES

DEEDED ROYALTIES

San Juan Basin & Permian Basin. Write Harry S Wright, Wright Bldg., Farmington New Mexico.

MONTANA ROYALTIES

Millions of acres now leased by world's major companies, with huge drilling play in prospect. For booklet describing Montana geology and oil development, write Landowners Royalty Company, Box 1225 Great Falls, Montana.

FOR SALE: Producing oil and gas wells in Kansas, payout 25% on annual investment; leases and royalties in Nebraska. Inland Oil Co., 1940 Mentor, Wichita, Kansas.

WESTERN NEBRASKA

Oil, gas royalty in proven Cheyenne County or nearby wildcat. Write, wire, phone. Smith-Enders Land Co., Kimball, Nebraska.

LEASE AND DRILLING BLOCKS

8,000 Acres Van Buren County, Arkansas. Anyone interested in good block for development on plant anticline write or wire W. S. Stephenson, Clinton, Arkansas.

FOR SALE: Oil and Gas Leases and drilling propositions in shallow territory of Allen, Simpson, and Warren Counties, Kentucky. W. P. Harley, Bowling Green, Kentucky.

WANTED—Settled production in Illinois, Indiana, and Kentucky. Also, shallow drilling deals. Give full particulars. Box D-449, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL AND GAS LAND FOR LEASE!!

WE HOLD 3,800 acres of Government & State leased lands, some of it close to producing areas in Carbon and Sweetwater Counties. Will sell some of our royalty. L. J. Lincecum & Associates, 817 West Pine Street, Rawlins, Wyoming.

GEOLOGIST AND LAND MAN, authority on Denver Basin and East Colorado, seeks association with aggressive operator desiring lease blocks and willing to finance. F. N. Bosco, 704 Colorado Bldg., Denver, Colorado.

LEASES ROYALTIES

Producing and Nonproducing

Bought and Sold—Any Area

Inquiries Invited

B. D. BUCKLEY

6376 Clayton Road, St. Louis 17, Mo.

REEF TREND DRILLING BLOCK

Have large drilling block North of Scurry and Kent Counties in the Canyon reef trend. Very reasonable drilling deal offered to reliable operator financially able to drill deep test.

P.O. BOX 1032

LUBBOCK, TEXAS

North Dakota Minerals and Leases

Bought direct for you on your purchase order. Our lease block map and reprint of press and magazine articles clearly outlining this play mailed on request.

(Purchase orders accepted only from those connected with the oil industry or royalty business).

Wire, Write or Call

JOHN ALLEN or BILL McBIRNEY

Suite 200, Grand Pacific Hotel

Bismarck, North Dakota

(Member National Oil Scouts and Landmen Association. References exchanged).

LEASE AND DRILLING BLOCKS

THE LOGS OF SEVEN producing gas wells drilled on my 640 acres to top of Mississippi lime 700-ft. in Labette Co., Kansas, definitely show a very pronounced and undeniable existence of a structure, Arbuckle and Simpson formations will be encountered around 1060-Ft. Will give controlling interest for a well cost $6,500.00. Further information: Box 254, Chetopa, Kansas.

REAL ESTATE

90,000 ACRES with minerals, South Central Colorado. Some bottom meadow, good grass, creek water. Write for description. A real buy at $6.50 per acre. Guy Speakman, 1326 East Kiowa, Colorado Springs, Colorado.

FOR LEASE

ATTRACTIVE office space to lease in new oil building in Key West Texas oil city—Abilene, Texas. Ready for occupancy on or about Sept. 1st. Fire-Proof, Year around air-conditioning, janitorial service and parking space adjacent to building. Modern selected office arrangements. Contact Jimmy Partin, Tel. 8561, Abilene, Texas.

WANTED

DRILLING DEALS, proven and semi-proven acreage wanted. Also royalties and producing properties. Send full particulars in first letter to P. O. Box 2161, Cincinnati 1, Ohio.

ESTABLISHED oil tool manufacturer with own sales organization is interested in securing California sales distribution for oil field products, or will manufacture on a licensed basis. Box D-454, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: SURPLUS Chemicals, Oils, Waxes, Solvents, Wastes and Residues of all kinds. Chemical Service Corporation, 98-06 Beaver St., New York 5, N. Y.

WANTED—PRODUCTION

Will buy producing properties in Texas and/or Oklahoma. Must deal direct with owner. Mail description data to: Box D-433, The Oil and Gas Journal, Tulsa, Oklahoma.

Will Purchase Producing Properties

Large value developed producing leases or royalties wanted. Will purchase highest quality properties only. Substantial annual income required. Highest values will be paid with reasonable cash payment. Those with properties of this type who have definite sales control are invited to submit with full details to

Box D-458

The Oil and Gas Journal

Tulsa Oklahoma

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1906 Oil-Gas (all states), Business, Real Estate Legal Forms, Leases, Revised With Government Regulations, Commercial Printing, Catalog and Samples on request. Burkhart Printing & Stationery Company, 115 south Cincinnati, Tulsa 3, Oklahoma.

FOR SALE

FOR SALE: Steel Building 8000 Sq. Ft., Lot 15,000 Sq. Ft., Fronts 2 streets and highway, 1 block from Railroad Spur. Suitable for Oil Field Supply House. Located in Abilene, Texas. Contact Jimmy Partin, Abilene, Texas.

ALUMINUM PAINT — 400 5-gallon cans, 480 quarts—Exterior Gilsonite Base, Highly Polished Pure Aluminum Pigment. Waterproof, ideal for tanks, roofs, buildings, equipment. Covers 300 to 400 square feet to the gallon. Distributors Liquidation. Regular price $6.95 gallon. Take any part—$10.00 for 5 gallons, $7 for 12 quarts. Send Check With Order. The National, 606 Walnut, Kansas City, Mo.

FOR SALE

Executive five-passenger twin-engine Lockheed 12-A, formerly owned by major oil company. Recent major engine and frame overhaul; Latest VHF radio, new automatic radio compass; Auxiliary tanks, New full-feathering hydromatic propellors. Priced very reasonably. Box D-459, The Oil and Gas Journal, Tulsa, Oklahoma.

1946 BEECHCRAFT D-18-S
$35,000.00

Hamilton Standard hydromatic full-feathering propellers — 30 hours since major overhaul airframe and Pratt & Whitney engines—Plush executive interior—Full airline instruments and radio —Total time airframe and engines only 1030 hours—Licensed radio telephone.

Inquire

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475 Fifth Avenue
New York City
Phone MU6-8477

EQUIPMENT MEN

(Continued from page 304)

Speyer and Hill Get Champion Promotions

Promotion of Howard B. Speyer to vice president, and T. A. Hill to secretary of Champion Spark Plug Co., has been announced by R. A. Stranahan, president. Speyer joined Champion in 1923 and was made secretary and assistant treasurer in 1935. He is vice president and director of Champion Spark Plug Co., Windsor, Canada, and is a director of the Champion firm in Feltham, England. Hill, formerly associated with Ohio Savings Bank & Trust Co., National Supply Co., and Ohio Audit & System Co., joined Champion in 1936 as an auditor. In 1938 he was made assistant secretary and later appointed office manager. Other officers of Champion are R. A. Stranahan, president; F. D. Stranahan, vice president and treasurer; Duane Stranahan, executive vice president; R. A. Stranahan, Jr., J. F. Lewis, Jr., M. C. Dewitt, and R. H. Rowland, vice presidents.

Smith Elected President Of M. W. Kellogg Co.

W. L. SMITH

B. ARCHAMBAULT

G. F. BAYES

R. B. SMITH

Warren L. Smith, former senior vice president, has been elected president of M. W. Kellogg Co., succeeding Harold R. Austin, who has retired, it has been announced following the annual meeting of the board of directors. Concurrently the executive staff was enlarged with Bennett Archambault, former treasurer, being elected vice president and general manager, a newly created post. The board also named G. Frank Bayes, Ronald B. Smith, and Zary A. Toula to be vice presidents. Incumbent vice presidents Dr. William E. Hanford, Alexander Kidd, and Frank Liebrecht were reelected. Daniel J. Olsen was elected treasurer and comptroller and Edwin L. Gidley, secretary.

W. L. Smith has been with the company since 1937, and subsequently became vice president of the parent company in 1943. Three years later, he assumed complete charge of the company's commercial activities.

Archambault joined Kellogg in 1946, after wartime service as head of the London office of the Government's office of Scientific Research and Development. Bayes has been actively engaged in the construction phase of Kellogg activities for 30 years. He was named director of construction in 1944. Highlight of his carreer came during the war when, in a span of a little more than 3 years, he directed the construction of 50 major refinery and chemical projects.

Ronald Smith, who joined Kellogg in 1948 as director of engineering, is also a consultant to the Atomic Energy Commission.

Toula, prominent as a chemical-engineering consultant throughout Europe, has been associated with Kellogg for 20 years. With headquarters in Paris, he will guide Kellogg's Eastern Hemisphere commercial activities.

Fahey, Johnson Get Bryan & Associates Appointments

Appointment of J. M. (Mike) Fahey as cost-control officer, and Joseph E. Johnson as project engineer, for Thomas Bryan & Associates, Houston building and engineering firm, has been announced by president Thomas S. Bryan.

Fahey, a graduate of Washington University law school in 1924, comes to the firm from Harold Van Buskirk Co., Houston contractors.

Previously, Fahey was with the James Stewart Corp., and Stone & Webster Engineering Corp., as personnel superintendent. He will handle cost control for the company's operations in five states.

Johnson comes to Thomas Bryan & Associates from Birmingham, where he served as estimator and project engineer for Rust Engineering Co.

National Supply Confirms Changes in Sales Staff

National Supply Co., Ltd., has announced the appointment of R. Wesley Burns as division manager at Calgary, Alta., Canada; Robert A. Seale has been appointed manager of the Shreveport district of National Supply Co.; and Howard G. Texter, chief field engineer for Spang-Chalfant division of National Supply, has announced the transfer of David C. Neely, field engineer at Houston, to the field engineering department at Tulsa. At the same time he announced the move of C. C. Brush, sales representative, at Houston, to the field engineering department at Houston.

Burns has been with National Supply since 1921. He has served in store sales, field sales, field engineering, and was a store manager at Craig, Colo. In June 1949 he was made assistant division sales manager at Calgary. His new position makes him the active operating head of the Canadian company.

Seale has been engaged in oil-industry work in the Shreveport area since 1934 and was branch manager for Hughes Tool Co. at Shreveport for 12 years prior to joining National Supply. He succeeds M. R. Brinkerhoff, district manager at Shreveport for the past 10 years, who was recently appointed assistant division credit manager for the territory comprising Louisiana, Mississippi, Alabama, East Texas, and southern Arkansas.

Neely started with Spang-Chalfant in 1934. In 1937 he was transferred to Houston as field representative and later was made field engineer. Brush joined the company in 1925 and has been a sales representative in Houston since 1933.

Hercules Relocates Houston Sales and Service Branch

Hercules Motors Corp., Canton, Ohio, has announced the relocation of its Houston branch on Conti Street to a centrally located address at 6818 Navigation Boulevard. A complete stock of Hercules service repair parts will be maintained at all times as well as an enlarged stock of Hercules engines and power units. A new, fully equipped machine shop has been installed to provide quick and economical repairs and overhaul on diesel, gasoline, and natural-gas engines and power units. In addition to the Houston branch, Hercules offers similar sales and service facilities in its factory branches in Los Angeles; Salem, Ill., and Odessa and Kilgore, Tex.

Campbell Visits Mexico

Arch F. Campbell, manager of the Tulsa branch of General Motors Corp.'s Diesel Division, has just returned from a 2-week trip during which he visited oil centers and General Motors diesel distributors throughout Mexico.

P-B and B-J Announce Joint Sales Personnel

J. P. Magoffin, general sales manager of Patterson-Ballagh Division, Byron Jackson Co., and B. A. Hilliard, Jr., general sales manager of the Oil Tool Division, recently announced the appointments of George Dwyer and E. U. Bassham as joint sales representatives.

Dwyer will headquarter in Casper, Wyo., and Bassham in Oklahoma City. Dwyer joined Byron Jackson in 1941 and entered the sales department in 1948. He will handle the sales and service of the complete line of Patterson-Ballagh and Byron Jackson products in the Rocky Mountain territory.

Bassham worked for 20 years for Cities Service Oil Co. before joining the sales organization of Patterson-Ballagh and Byron Jackson. He will handle the sales of the complete line of both divisions in the Kansas and Oklahoma areas.

Electric Products Adds To Sales Organization

G. J. Berry, vice president in charge of sales, Electric Products Co., Cleveland, has announced the appointment of E. G. Schroeder as sales manager of the firm and of Sheldon Storer & Associates as district representatives for the southwestern section of Ohio and the entire state of Kentucky.

Schroeder, who was previously associated with the company as field sales manager, and prior to that as district manager of the Detroit office, is a graduate electrical engineer of Renssaeler Polytechnic Institute and was associated with New York Electric & Gas Corp. and General Electric Co. before joining Electric Products in 1945.

With offices in Cincinnati, Sheldon Storer will be responsible for promoting the line of synchronous and induction motors, a.c. and d.c. motors and generators, battery chargers, electrolytic power supplies, and frequency changers produced by Electric Products Co.

CALENDAR OF EVENTS

April

American Petroleum Institute, Division of Marketing, Muehlebach Hotel, Kansas City, April 24-25.

Natural Gasoline Association of America, annual convention, Texas Hotel, Fort Worth, April 24-26.

American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, and Society of Exploration Geophysicists, joint annual meeting Stevens Hotel, Chicago, April 24-27.

Oil Heat Institute of America and National Oil Heat Exposition, annual meeting, Commercial Museum, Philadelphia April 24-May 1.

American Petroleum Institute, Division of Production, eastern district meeting Cleveland Hotel, Cleveland, April 26-28

May

American Petroleum Institute, Division of Refining, midyear meeting, Hotel Cleveland, Cleveland, May 1-4.

Interstate Oil Compact Commission spring meeting, Biloxi, Miss., May 4-6.

National Stripper Well Association, Biltmore Hotel, Los Angeles, May 7-9.

Independent Petroleum Association of America, midyear meeting, Biltmore Hotel Los Angeles, May 7-9.

American Gas Association, Natural Gas Department, spring meeting, Mayo Hotel Tulsa, May 8-9.

Liquefied Petroleum Gas Association, annual convention, Palmer House, Chicago May 8-11.

American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles, May 11 12

American Petroleum Institute, central committees on accident and fire prevention, midyear meeting, Atlantic City, N. J., May 15-18.

American Gas Association, production and chemical conference, Hotel New Yorker New York, May 22-24.

American Institute of Chemical Engineers, regional meeting, New Ocean House Swampscott, Mass., May 28-31.

Gas Technology Short Course, Texas College of Arts and Industries, Kingsville Tex., May 29-31.

June

National Oil Scouts and Landmen's Association, Skirvin Tower Hotel, Oklahoma City, June 8-10.

American Society of Mechanical Engineers, oil and gas power division, Lorc Baltimore Hotel, Baltimore, June 12-16

Pennsylvania Grade Crude Oil Association, Hotel William Penn, Pittsburgh, Pa June 15-16.

Petroleum Equipment Suppliers Association, annual membership meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., June 18-20.

American Society of Mechanical Engineers, Hotel Statler, St. Louis, June 19-23

Canadian Gas Association, annual convention, Manoir Richelieu Hotel, Murray Bay, Quebec, June 19-24.

Kentucky Oil and Gas Association, annual meeting, Lexington, Ky., June 22-23.

American Society for Testing Materials, annual meeting Chalfonte-Haddon Hall, Atlantic City, N. J., June 26-30.

American Petroleum Institute, midyear division of production and standardization conference, Brown Palace Hotel, Denver, June 26-30.

July

Institute of Petroleum, oil shale and cannel coal conference, Glasgow, Scotland, July 3-7.

August

Interstate Oil Compact Commission, summer meeting, French Lick, Ind., August 3-5.

September

National Chemical Exposition, Chicago Coliseum, Chicago, September 5-9.

American Society of Mechanical Engineers and Instrument Society of America, Municipal Auditorium, Buffalo, N. Y., September 11-15.

National Petroleum Association, Hotel Traymore, Atlantic City, N. J., September 13-15.

American Society of Mechanical Engineers, petroleum mechanical engineering conference, Roosevelt Hotel, New Orleans, September 25-27.

Instrument Society of America, annual instrument conference and exhibit, Memorial Auditorium, Buffalo, N. Y., September 18-22.

October

American Gas Association, annual convention, Atlantic City, N. J., October 2-6.

Mid-Continent Oil and Gas Association, Texas division, Dallas, October 4-5.

Petroleum Branch, American Institute of Mining and Metallurgical Engineers, Mid-Continent meeting, Roosevelt Hotel, New Orleans, October 4-6.

American Association of Oilwell Drilling Contractors, annual meeting Mayo Hotel Tulsa, October 9-10.

Petroleum Branch, American Institute of Mining and Metallurgical Engineers, West Coast meeting, Elks Club, Los Angeles, October 12-13.

November

Mid-Continent Oil and Gas Association, Louisiana-Arkansas Division, annual meeting, Roosevelt Hotel, New Orleans, November 2-3.

American Petroleum Institute, annual meeting, Biltmore and Ambassador Hotels Los Angeles, November 13-16.

American Society of Mechanical Engineers, Hotel Statler, New York, November 26-December 1.

December

American Institute of Chemical Engineers, annual meeting, Columbus, Ohio, December 3-6.

NOMADS

Tulsa Nomads, third Friday of each month. After Five Room, Tulsa Hotel.

Dallas-Fort Worth Nomads, first Monday of each month, Greater Dallas Club.

Houston Nomads, second Monday of each month. Ye Ole College Inn, Houston.

Los Angeles Nomads, second Wednesday of each month, Jonathan Club.

New York Nomads: May 10, annual invitation dinner, Louis Sherry's, and June 13-15, golf party, Westchester.

ADVERTISERS

Abegg & Reinhold Co. 274
Advertising Council, The 109
Allis-Chalmers Mfg. Co. 89
Allis-Chalmers Mfg. Co. (Tractor Div.) 75
Alten's Foundry & Machine Works 295
Aluminum Co. of America 31, 53
American Air Filter Co., Inc. 88
American Blower Corp. 272
American Brass Co., The 41
American Car and Foundry Company 110
American Manufacturing Co. of Texas 4
American Optical Company 27
American Recording Chart Co. 286
Ampco Metal, Inc. 250
Anchor Petroleum Company 253
Ansul Chemical Co. 194
Armco Drainage & Metal Products, Inc. 152
Armstrong Machine Works 84
Automatic Sprinkler Corp. of America 199

Baker Oil Tools, Inc. 130
Bank of Toronto, The 271
Barrett Division of Allied Chemical & Dye Corp. 102
Beaver Pipe Tools, Inc. 270
Bethlehem Supply Co. 15
Bettis Corporation 279
Bingham Pump Co. 79
Black, Sivalls & Bryson, Inc. 12, 13
Blaw-Knox Construction Company 219
Bonney Forge & Tool Works 204
Born Engineering Company 221
Boston Woven Hose & Rubber Company 173
Boyd Co., Clarence L. 266
Briggs Bituminous Composition Co. 263
Brown Fintube Co., The 30
Burgess-Manning Company 85
Butler Manufacturing Company 228
Byron Jackson Co. 10

Cameron & Co., Wm. 224
Cameron Iron Works, Inc. 69
Cast Iron Pipe Research Association 224
Centriline Corporation, Subsidiary of Raymond Concrete Pile Co. 121
Chevrolet Motor Div., General Motors Corp. 39
Chicago & Southern Air Lines 288
Chicago Bridge & Iron Company 161
Chicago Metal Hose Corporation 68
Childers Manufacturing Co. 250
Chipman Chemical Co. 203
Cities Service Oil Co. 275
Clark Bros. Co., Inc. 26
Classified Advertising 305, 306, 307, 308
Cleveland Trencher Company, The 231
Colorado Fuel and Iron Corp., Wickwire Spencer Steel Division 103
Combustion Engineering-Superheater, Inc. 116
Continental Oil Co. 112
Continental Supply Co., The 201
Cooper-Bessemer Corp., The 164, 165
Crane Packing Company 285
Crose Manufacturing Co., Inc., M. J. 266
Cutler-Hammer, Inc. *32

Darling Valve and Mfg. Co. 238
Davis Regulator Co. 212
Dean Brothers Pumps, Inc. 212
Dearborn Chemical Co. 189
De Laval Steam Turbine Co. 90, 91
Delta Engineering Sales Co. 277
Dollinger Corporation 63
Dow Chemical Co., The 3
Dowell Incorporated 128
Dresser Engineering Company 198
Dresser Industries, Inc. 26, 218
Dresser Manufacturing Division 218
Drilling & Service, Inc. 292
Drilling Specialties Co. 282
Duff-Norton Mfg. Co. 123
du Pont 22, 257, 258

Eaton Manufacturing Company, Axle Division 235
Edward Valves, Inc. 20
Electric Auto-Lite Co., The 238
Ellerbee Brothers 184
Elliott Co. 236
Empire Trust Company 220
Emsco Derrick & Equipment Co. 270
Ensign Carburetor Company 14
Erie Meter Systems, Inc. 239

Fairbanks, Morse & Co. 2
Falstrom Company 232
Farrel-Birmingham Co., Inc. 83
Federal Motor Truck Co. 182
First National Bank & Trust Co. of Tulsa, The 111
First National Bank in Houston 222
Flint Steel Corporation 71
Floridin Company 232
Fluor Corporation, Ltd., The 244, 245, 256
Ford Motor Company 16
Foster Wheeler Corp. 51, 52
Four Wheel Drive Auto Co., The 21
Foxboro Company, The 64
Fuller Company 104
Fulton-Sylphon Division Robertshaw-Fulton Controls Co. 122

Gasoline Plant Construction Corp. 74
Gates Rubber Co., The 29
General American Transportation Corporation 167
General Electric Company 55
General Tire & Rubber Co., The 45
Geolograph Company, Inc., The 224
Glitsch & Sons, Inc., Fritz W. 193
Goodyear Tire & Rubber Company 9
Gott Mfg. Co., H. P. 271
Goulds Pumps, Inc. 265
Grancell, I. H. 274
Graver Tank & Mfg. Co., Inc. 65
Green Contracting and Engineering Co., Inc. 214
Grove Regulator Co. 44
Gunite Concrete & Construction Co. 278

Haering & Co., Inc., D. W. 216
Happy Company, The 217
Harrisburg Steel Corporation 294
Helicoid Gage Division, American Chain & Cable Co. 195
Hercules Motors Corp. 70
Hinderliter Tool Co., Div., H. K. Porter Company, Inc. 273
Homestead Valve Manufacturing Co. 97
Houghton Laboratories, Inc. 222
Hudson Engineering Corporation 78
Huey & Co., S. E. 268
Hughes Tool Co. Back Cover
Industrial Division, Minneapolis-Honeywell Regulator Co. 56, 57
Infilco Incorporated 94
Ingersoll-Rand 66
International Harvester Co. 171
Jenkins Bros. 42
Jensen Brothers Mfg. Co. 272
Jerguson Gage & Valve Co. 278
Johns-Manville Corporation 235
Johnston & Jennings Company, The Division of Pellibone Mulliken Corporation 207
Johnston Pump Co. 226
Jones & Laughlin Supply Co. 40
Kaiser Steel Corporation 8
Kellogg Co., The M. W. 17, 18
Klemp Company, Wm. F. 212
Koch Engineering Company, Inc., The 181
Ladish Co. 77
Landis Machine Co., The 7
Larkin Packer Co. 205
Leyman Manufacturing Corp. 266
L-K Pump Valve Co. 215
Lloyd Metal Foundry Co. 263
Lufkin Foundry & Machine Co. 58
Lufkin Rule Company 207
Lummus Co., The 118, 119
Lunkenheimer Co., The 67
Mallinckrodt Chemical Works 80
Manning, Maxwell & Moore, Inc. 62
Manzel Division of Frontier Industries, Inc. 120
Mark & Company, Clayton 215
Marley Company, Inc., The 210
Marlow Pumps 279
Marman Products Co., Inc. 271
Marsh Instrument Co. 108
Maxim Silencer Company 276
McCord Corporation 293
Mercoid Corp., The 192
Metal & Thermit Corporation 265
Metal Goods Corporation 76
Metallic Building Company 231
Metals Disintegrating Company, Inc. 260
Midwest Piping & Supply Co., Inc. 54
Mines Equipment Division, Joy Manufacturing Company 281
Minneapolis-Moline 275
Mission Mfg. Company 158
Nash Engineering Co. 115
Natasco Company 200
National Airoil Burner Co., The 98
National Bank of Tulsa 101
National Supply Co., The 262
National Tube Company 24
Natural Gas Odorizing Company, Inc. 280
Naylor Pipe Company 255
Nelson Electric Mfg. Co. 251
Newalls Insulation Co., Ltd. 117
Nicholson & Co., W. H. 278
Nordstrom Valve Division, Rockwell Manufacturing Company 72, 73
Norris Brothers, Inc. 272

Oakite Products, Inc. 197
Ohio Injector Company 25
Oil and Gas Journal, The 279
Oil Well Supply Co. 49
Oklahoma Contracting Corporation 268
Olsen, O. L. 241
Onan & Sons, Inc., D. W. 267
Orbit Valve Company 179
Owens-Corning Fiberglas Corp. 59

Pacific Pumps, Inc. 252
Pacific Valves, Inc. 268
Paris Distributor, Inc., Henry H. 206
Parkersburg Machine Company 274
Parkersburg Rig & Reel Co. 99
Peerless Pump Division of Food Machinery & Chemical Corporation 38
Pelican Well Tool & Supply Co. 287
Penberthy Injector Co. 125
Perrault Brothers 264
Petro-Chem Development Co., Inc. 202
Petroleum Engineering, Inc. 175
Petroleum Rectifying Company 11
Philadelphia Gear Works, Inc. 48
Pittsburgh Equitable Meter Division Rockwell Manufacturing Company 50
Pittsburgh Lectrodryer Corp. 5
Pittsburgh Steel Company 86
Powell Co., The Wm. 114
Powers Regulator Co., The 283
Pritchard & Co., J. F. 100

Radio Corporation of America 35
Ratigan, Inc., J. P. 113
Raybestos-Manhattan, Inc., Packing Div. 92
Rector Well Equipment Co., Inc. 284
Refinery Supply Co., The 196
Republic Steel Corporation 37
Ridge Tool Company, The 237
Robbins & Myers, Inc. 290
Ross-Martin Co. 274
Russell & Stoll Company, Inc. 203
Santa Fe Tank & Tower Company 215
Schutte and Koerting Company 61
Scott Aviation Corp. 238
Shell Development Company, Inc. 34
Skirvin Hotels 288
Smith Corporation, A. O. 19
Socony-Vacuum Oil Co., Inc. 36
Stacey Manufacturing Co., The 287
Standard Oil Co. of California 60
Standard Pressed Steel Co. 284
Standco Brake Lining Co. 274
Stearns-Roger Mfg. Co., The 96
Steel Forgings, Inc. 269
Timken Roller Bearing Company 6
Trans-Texas Airways 284
Trimont Manufacturing Co. 28
Trojan Construction Co., Inc. 267
Twin Disc Clutch Co. 43

United Centrifugal Pumps, Division of United Iron Works 81
U. S. Steel Corp. Subsidiaries 24, 49
United States Treasury Department 87
Unit Rig & Equipment Co. Inside Front Cover
Universal Oil Products Co. 226, 227
Vapor Recovery Systems Co., The 95
Victaulic Co. of America 192
Vinson Supply Co. 191
Vogt Machine Co., Henry 93
Voss Co., Inc., J. H. H. 264
Vulcan Steel Tank Corporation 196

Wagner Electric Corporation 82
Wales Trucking Co. 268
Walworth Co. 1
Warren Petroleum Corp. Front Cover
Waukesha Motor Company 33
Wedgeplug Valve Co., Inc. 269
Well Equipment Mfg. Corp. 124
Western Supply Company 126
Westinghouse Electric Corp. 46, 47
Whitmor Homebuilders 254
Wickwire Spencer Steel Division, Colorado Fuel and Iron Corp. 103
Williamson, Inc., T. D. 264
Wisconsin Motor Corporation 250
Worthington Pump & Machinery Corp. 23, 106, 107
Worth Steel Company 103
Wright Chemical Corporation 249
Wyatt Metal & Boiler Works Inside Back Cover

Yarnall-Waring Co. 239
Young Radiator Company 276
Zink Company, John 186

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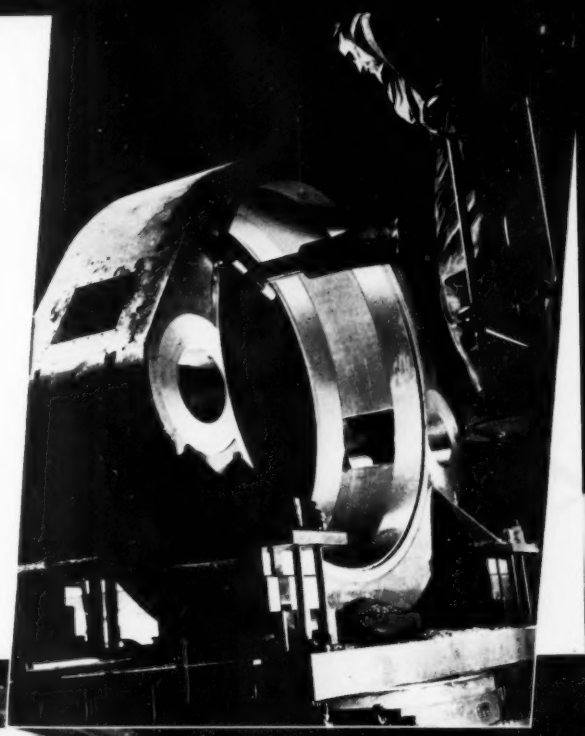

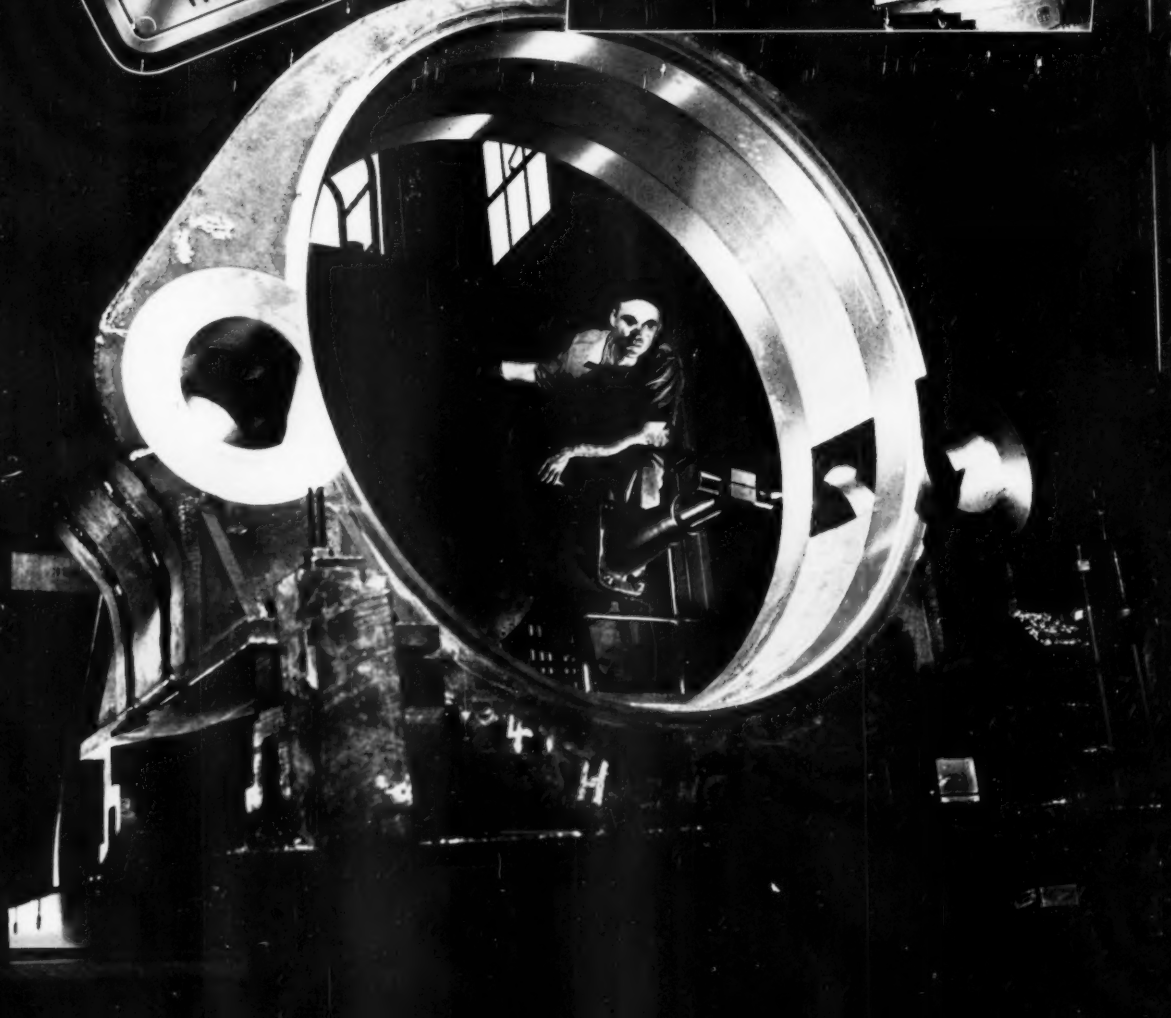

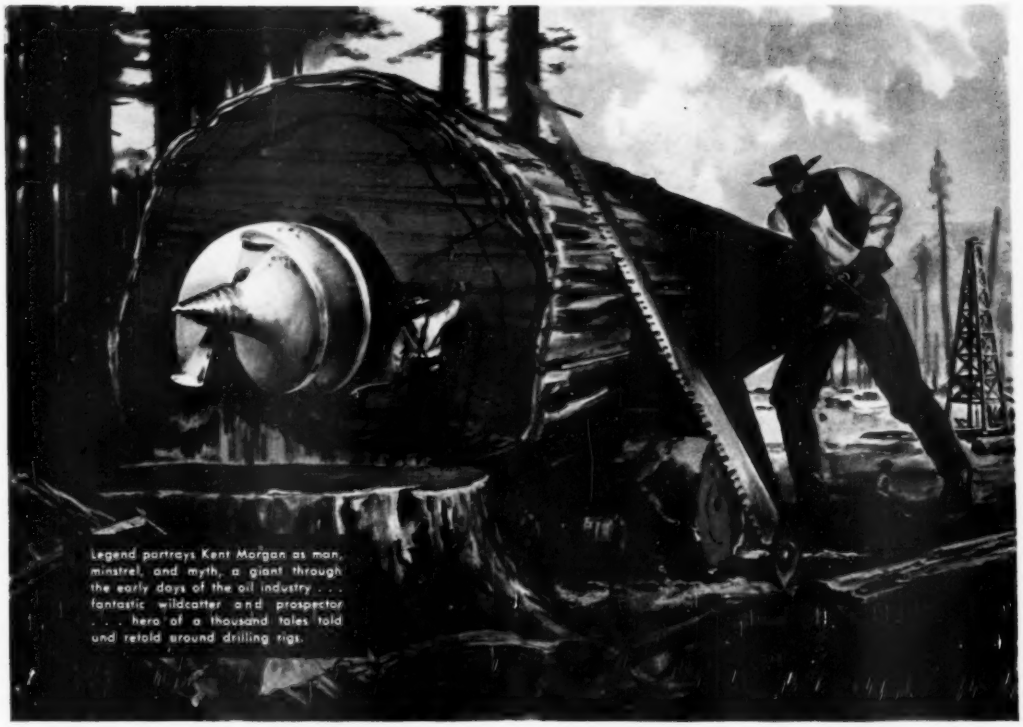

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Kent Morgan's Redwood Pipeline

When pipeline projects are discussed among oil men in modern-day transportation of crude, old-timers frequently recall the origin of pipeline installation and how much more fabulous it was than the present-day networks in fields throughout the nation. Fabulous it had to be, because the first pipeline was the handiwork of none other than Kent Morgan!

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